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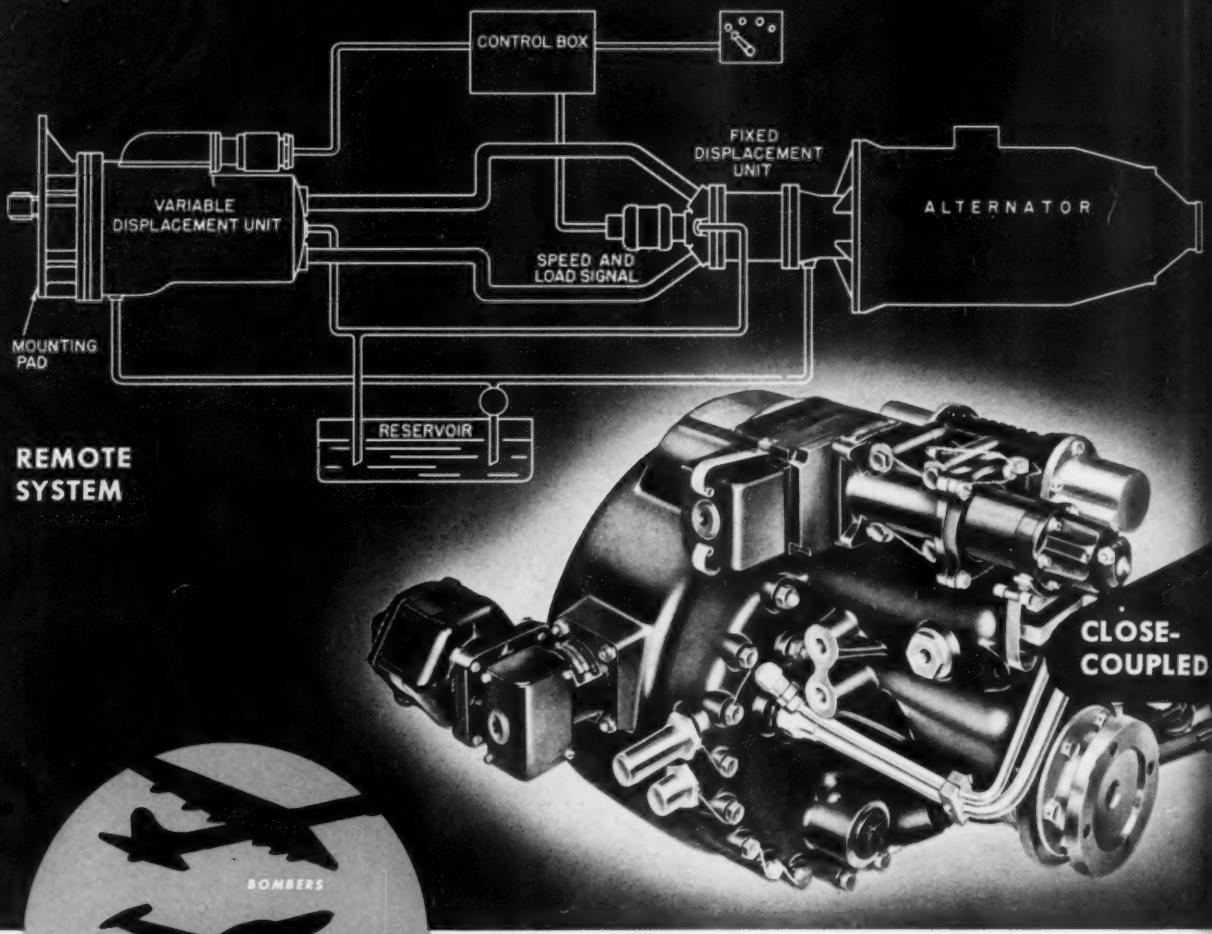

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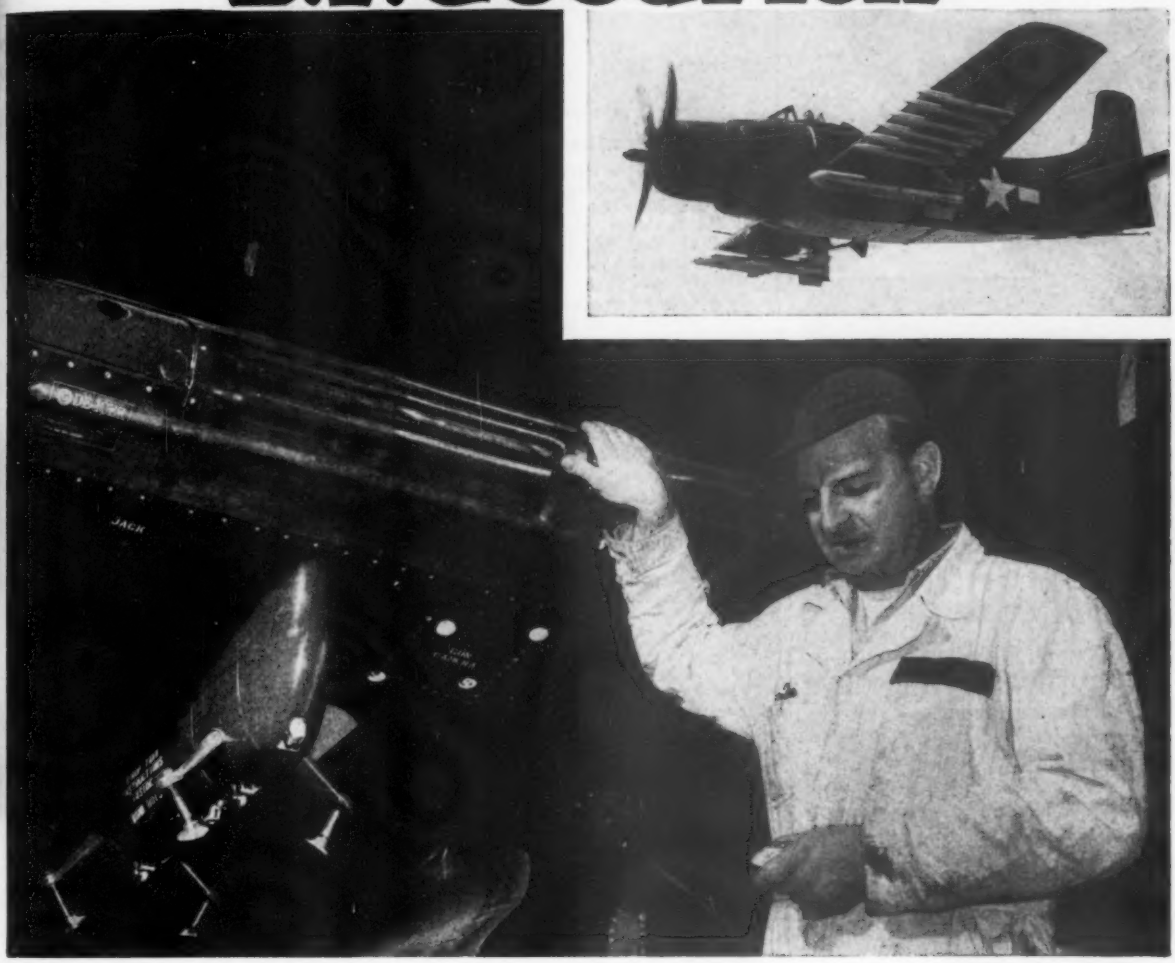

New De-Icer for fast night attacker proved in Korea

DOUGLAS SKYRAIDERS attacking with the fleet in Korea were forced to fly low at night because of the danger of ice forming at higher altitudes. They needed De-Icers—and fast.

De-Icers had never before been used on this type of high-speed plane. The Navy and Douglas brought the problem to B. F. Goodrich.

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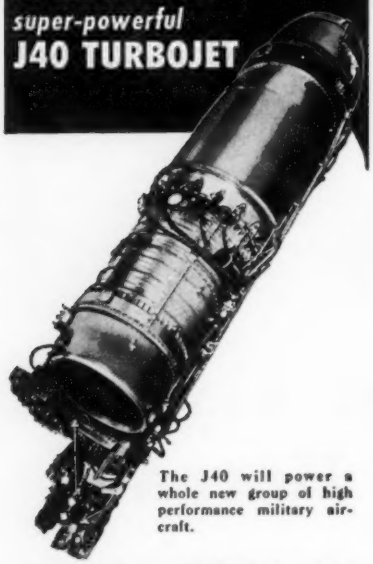

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Aviation Week

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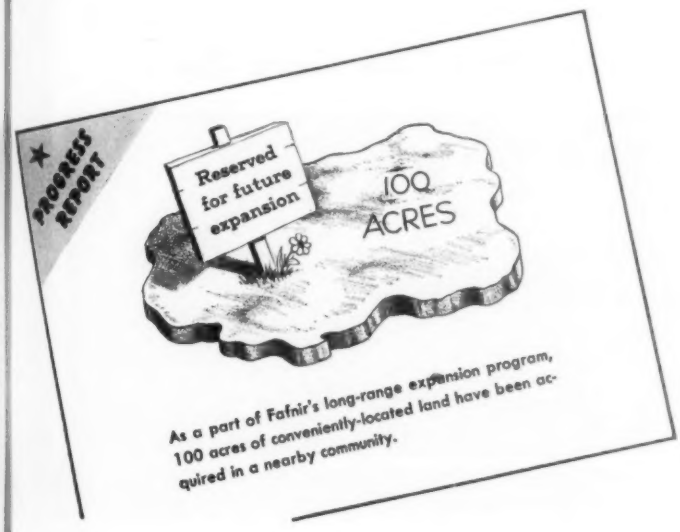
NORTHWEST Airlines

23 YEARS

FAFNIR

Birthday congratulations are in order. On October 1st, 1951, Northwest Airlines became 25 years old. From a single route between St. Paul-Minneapolis and Chicago, Northwest has expanded its system into an international route network of 20,454 certificated miles. Almost from the start, Northwest aircraft have flown on Fafnir Ball Bearings . . . as original equipment or replacements. To maintain this 23 year association, something more than good ball bearings is needed. It's the Fafnir attitude and aptitude . . . a way of looking at ball bearings from the user's viewpoint, an aptitude gained from nearly 25 years of specialization in aircraft bearings. The Fafnir Bearing Company, New Britain, Connecticut.



As a part of Fafnir's long-range expansion program, 100 acres of conveniently-located land have been acquired in a nearby community.

Fafnir Ball Bearing Rod Ends, one of the Fafnir Ball Bearing units regularly specified by Northwest Airlines. Light, compact design . . . outer race ground directly on shank member. Special heat treatment, an exclusive Fafnir feature, insures shank toughness — eliminates brittleness and cracking. Inner race extension beyond face obviates need of spacers.

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By Cable . . .

First Report on 'Exercise Cirrus'

AVIATION WEEK'S Dave Anderton was the only correspondent of a U. S. aviation business magazine covering "Exercise Cirrus," the joint air maneuvers in Europe that ended last week. While the judges were still weighing the final results, Anderton cabled the following preliminary analysis.

Headquarters, Allied Air Forces of Central Europe, Fontainebleau, France—Air forces of eight nations participating in Exercise Cirrus, large-scale air maneuvers concluded Sept. 30, were learning how to operate as an integrated force. And according to Lt. Gen. Lauris Norstad, USAF commanding officer in Central Europe who commanded the three-day exercise, the lesson was learned well.

Norstad emphasized repeatedly that the major aim of Cirrus was to point out weaknesses and deficiencies of an integrated force and the direction of future activity.

He said the maneuvers were not designed to test capabilities of pilots and planes, but to check the integrated chain of command, international control and reporting of information, joint operation with NATO ground forces and flexibility of operational air forces.

▶ **To Iron Curtain**—To those ends, the air forces of the U. S., United Kingdom, France, Belgium, Holland, Denmark, Norway and Italy were subjected to the three-day problem. The area covered included all the European continent west of the Iron Curtain between the German-Dutch coast and the Swiss frontier-Dijon-LeHavre line.

Basic assumption for the exercise was that relations had been deteriorating the past two years between Blueland-Western Germany, friendly—and Redland—Eastern Germany, enemy.

During that period, it was obvious that Redland was preparing aggression. Blueland mobilized an efficient motorized land force, air defense and tactical air force. On Sept. 3, Redland kicked off a major ground offensive supported by tactical air, starting an undeclared war. These forces drove to the Rhine River at the beginning of Operation Cirrus. Blueland ports and industry were bombed to a limited degree. Air fields, headquarters, radar and communications were hard hit by Red tactical air.

As air exercise opened Blueland ground forces were about to jump off on a counter-offensive across the Rhine between Coblenz and Strasbourg. This was exercise Jupiter, a joint U. S.-French maneuver for which Cirrus provided ground support.

▶ **Weather, Bad**—Pending detailed analysis of intelligence reports, no general conclusions can be reached on efficiency of the exercise or success of Blueland forces in supporting Jupiter. But Gen. Norstad, in a press briefing the morning following conclusions of Cirrus, presented preliminary results. Weather, he said, interfered with operations—no news to the press party, which saw virtually nothing of maneuvers because of bad flying conditions.

But this was an unexpected advantage because it provided checks on the functioning of current bad weather equipment. Despite the weather, general air activity approximated that expected. Communications went well and operating squadrons were satisfied.

▶ **Better Fields**—One of the most impressive features of the maneuvers, said Gen. Norstad, was the amazing improvement in airfield construction. Cirrus used 23 air bases, all long enough to handle jets and with adequate taxiways. This contrasted with Exercise Ombrelle last June, where runways were short and taxiways inadequate.

Norstad had high praise for the French squadron at Coblenz. Within one minute and sixteen seconds after the scramble order, the first element of two planes was in the air. A section of eight was airborne under two minutes total. In some cases, reconnaissance units were 50 miles from the ground forces they were aiding. This was known to be bad, but was partly necessary because of available fields. At Chievre, two Belgian and one Danish squadron were using one base and control center. A French squadron diverted to the base was completely integrated with no disruption.

Redeployment by air of squadrons went well. Groups were given 24-hour notice of the base shift. They were required to make the change by air troop carrier aircraft, USAF C-47 and C-119 and Belgian C-47, available to support.

▶ **Sitting Ducks**—The radar network functioned well. Only one raid of 20 planes was undetected. Camouflage was poor. In places, I saw Belgian Meteors completely covered with nets but easily spotted in the middle of hardstands visible miles away.

Norstad said that in some cases fields were just sodded. Because of replacement cost, it was not desirable to run aircraft across them and ruin the grass. So in some cases planes were hand-carried from taxiways to dispersal points.

It is difficult to put an overall appraisal on Cirrus for several reasons:

- **One, equipment** used was mostly obsolescent. There were no sweptwing jets, no jet bombers and reconnaissance planes.
- **Two, existing fields** and roads were used to avoid costly destruction of property.
- **Three, there was no complete realism** of blackouts, and live or dummy ammunition was not used.
- **Four, war games never** inspire the maximum effort of the real thing.

▶ **Primer**—So a fair summary of Cirrus might be that it is a starting point—a primary school exercise. As the nations mature under integrated command, mutual appraisal and understanding, the curriculum gets tougher. The problems become more practical and penalties for failure more severe.

Eventually, out of the advanced schooling, comes a hard, professional core composed of men and efforts of many nations. That tough cadre becomes the central core of future NATO air power expansion.

The real aim of Cirrus, therefore, seems idealistic. It was to introduce John to Jacques and Jan so that they might be better able to work together. No combined effort could have a better goal.

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500 LB.-IN. POCKET-SIZED ANGLgear

Photographed beside shotgun shells to show size and compact design

The Model R-300-X high ultimate strength ANGLgear is now available to withstand static loads up to 500 lb.-in. For applications where the standard model R-300 with 250 lb.-in. rating is marginal, the R-300-X is the answer. It is especially suited for manual operation of remotely located valves or controls which may develop high break-away torques.

Both the R-300 and the R-300-X are rated for transmission of 1/3 hp at 1,800 rpm. All models are lubricated for life and made with hardened gears, antifriction bearings, three-bolt side and flanged end-mountings with internal pilots.

See IAS Aeronautical Catalog for Dimensions

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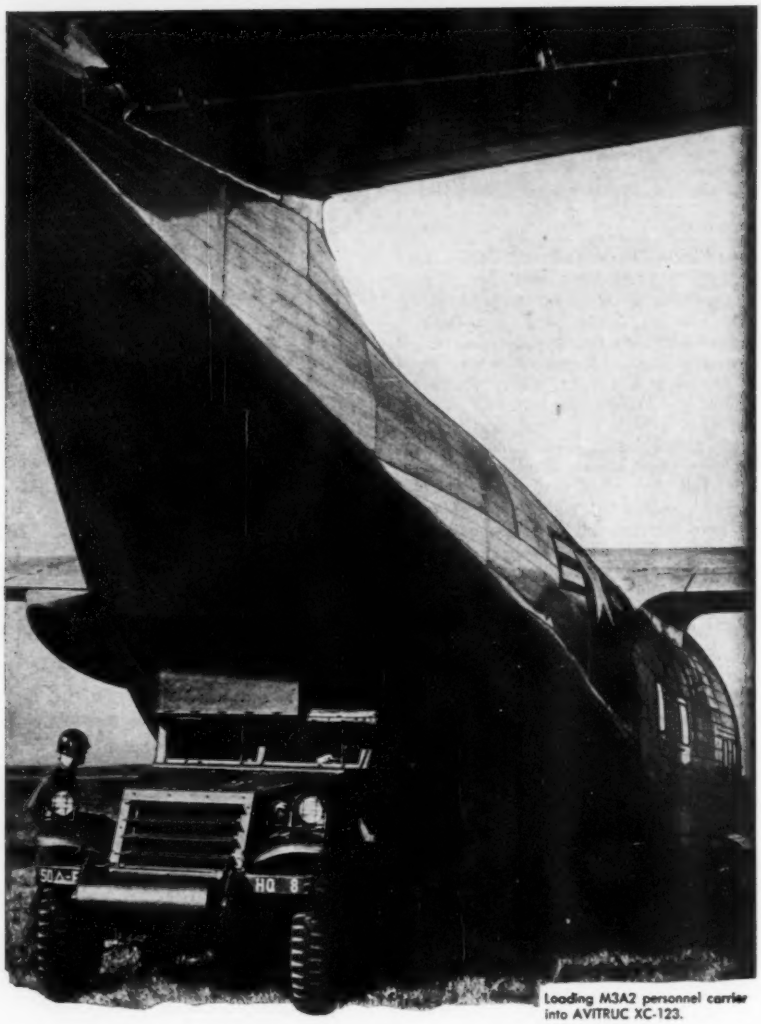

Loading M3A2 personnel carrier into AVITRUC XC-123.

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NEWS DIGEST

DOMESTIC

Paul V. Shields resigned as chairman of Curtiss-Wright Corp.'s board and has been succeeded in this post by Roy T. Hurley, C-W president, who will hold both offices. Shields will continue as chairman until the end of the year, will then devote more time to his investment banking and other interests.

Thompson Products, Inc., Cleveland, has purchased Antenna Research Lab, Columbus, Ohio, and named Robert Jacques, former head of the laboratory, as chief of Thompson's newly formed Electronics division.

American Airlines' 736 stewardesses have received a $20.42 monthly increase under terms of a new annual raise, cost-of-living allowance and base scale boost agreement reached by AA and the Air Line Stewards and Stewardesses Assn. The increase is subject to approval by WSB, will be retroactive to Aug. 1.

Lieut. Gen. Elwood R. (Pete) Quesada retired from active USAF duty after 26 years of service. He is 47 years old. Gen. Quesada's latest assignment was direction of a series of atomic tests at Eniwetok. It has been reported that he has differred with top officers on the use of tactical air power.

Brig. Gen. Mark E. Bradley, Jr., is expected to be promoted to Director, Procurement and Industrial Planning, of the Air Materiel Command. He has already been nominated as a major general. Brig. Gen. Nelson S. Talbott is due to be promoted to deputy under Gen. Bradley.

FINANCIAL

Northwest Airlines has declared a full year's dividends of $1.15 per share on the carrier's 4.6% cumulative preference stock, bringing up to date three previously deferred quarterly dividends of 28.75 cents each and adding the fourth-quarter dividend of the same amount. All dividends will be paid Nov. 1 to holders of the stock as of Oct. 19. NWA reported a net loss of $1,614,536 in the first quarter of this year, but profits in April, May and June erased the loss and resulted in net earnings of $47,593 for the six months ended June 30. Net earnings in July were $389,803 and in August $546,288.

INTERNATIONAL

SIAI-Marchetti, pioneer Italian aviation firm has been liquidated less than a month after another oldtimer, Breda, closed down its aviation department. Four factories were involved, employing approximately 4,000.

British European Airways first Airspeed Ambassador went into preliminary service Sept. 3 carrying some 300 passengers on the Paris run in three days. Cabin conditioning system tended to overheat interior on early runs.

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TEMCO means Aircraft, both engineering and production. Starting with a nucleus of highly trained technicians and one of the most modern facilities in the country, TEMCO has gained a reputation for craftsmanship and skilled aircraft fabrication that is recognized by the Armed Services and the nation's leading aircraft manufacturers.

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The T-35 Buckaroo was completely designed and developed by TEMCO. It is now being tested by the Air Force as a trainer and by the Ground Forces as a highly maneuverable support weapon.

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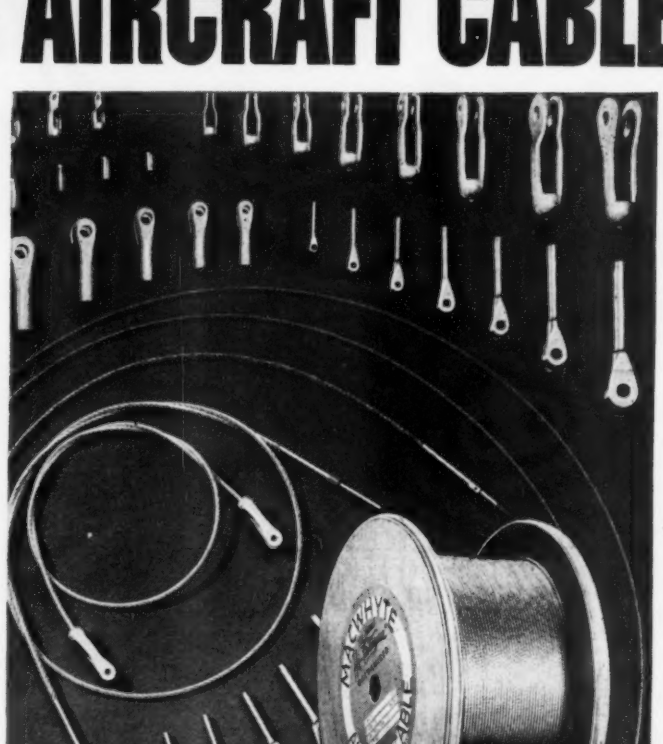

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1008-A

WHO'S WHERE

the Front Office

John A. Maxwell, Jr., and **Clyde Williams** ve been named vice presidents of Texas gineering & Mfg. Co., in charge of manacturing and as comptroller, respectively. th men are members of the original group o started with Temco in 1945; and both ved in the Texas division of North erican Aviation during the last war.

John W. Belanger has been named a vice esident of General Electric and also genal manager of the company's new Dense Products division. **Nicholas M. Duhemin** has also been designated a vice esident of GE. He was recently placed in harge of the Manufacturing Services division.

What They're Doing

Dr. James B. Rea, formerly an engineering consultant for Douglas Aircraft, has organized the J. B. Rea Co., Inc., to develop and make automatic control systems. A former Douglas research engineer, **Lawrence R. Stumpf,** has joined the new company as administrative engineer and business manager. The firm is located at 11941 Wilshire Blvd., Los Angeles.

Alden R. Sanborn has been designated field service manager for Chance Vought Aircraft; **Henry E. Kay** is the company's new contract administrator and has as his assistant **Thomas F. Seymour. Dale Marks** is Vought's new chief industrial engineer. **John W. McGuyrt** has been made chief test pilot.

George A. Page has been appointed director of research and engineering for Aeronca Mfg. Co. . . . **H. V. Rasmussen** has been named executive engineer for Worthington Pump & Machinery Corp. at Wellsville, N. Y. . . . **Orin Johnston** has been designated assistant to the manager of aviation operations, engineering and manufacturing of Minneapolis-Honeywell Regulator Co. Also, **Evert Welch** has been made administrative assistant; **Carl Anderson** has been promoted to assistant director of the service engineering department, **George Smith** succeeding him as chief field service engineer; and **Bill O'Neill** has been named chief of the project section.

David A. Gregory has been appointed director of Transocean Air Lines' new department of public relations and advertising.

Honors and Elections

Defense Secretary of the Philippines **Ramon Magsaysay** has been named to the board of Philippine Air Lines. Other new members are Labor Secretary **Jose Figueras,** Health Undersecretary **Regino Padua** and **Ludovico Mapa,** the latter in an acting capacity.

INDUSTRY OBSERVER

► Hudson Motor Co. has completed large subcontracting negotiations to make forward fuselage assemblies for the Boeing RB-47B bomber for Boeing-Wichita, and for the B-47B bomber for Douglas-Tulsa, using mechanical press capacity that will be available at the Gratiot, Detroit, body plant.

► Ft. Worth sources say that the sweptwing Convair B-60 development of the B-36 intercontinental bomber is complete and ready for roll-out except for completion of delivery of its eight Pratt & Whitney J-57 turbojet powerplants.

► A new Air Force competition for a medium jet bomber, which is now in the works, may be a means of getting the new British Vickers Valiant four-jet sweptwing bomber into U. S. production. The Valiant has been highly praised by U. S. military officials who have seen it fly, and Vickers is carrying on an active sales campaign with USAF. Another possibility might be use of a modification of it on the Navy super carrier, since the Valiant reportedly has a much slower landing speed than its principal competitor, the American B-47.

► Gyrodyne Co. of America has moved its co-axial GCA Model 2 helicopter to its new plant location at Flowerfield, L. I., where it plans to develop a helicopter manufacturing and research facility on a 362-acre tract, with 30,000 ft. of manufacturing space now available.

► A number of foreign manufacturers have written CAA asking to obtain plans for the AG-1 prototype CAA agricultural spray and duster plane designed by Fred Weick of Texas A&M College. CAA already has agreed to make blueprints of the plane available to any U. S. manufacturer, and some non-aviation companies as well as plane manufacturers already have requested the plans. But CAA does not intend to make its new agricultural development available to possible foreign competitors of U. S. plane manufacturers as long as there is indication that American companies are interested in going ahead with the development.

► Convair XC-99, which recently set another new unofficial airlift record for a single plane by carrying 90,000 lb. payload from Travis AFB, Calif. to Ft. Worth with a takeoff gross weight over 320,000 lb., is piling up quite a record in total pounds lifted. Before its modernization it had carried 1.5 million lb. cargo in 133 flight hours, and since it was modified it has carried more than 800,000 lb. cargo in approximately 100 hr., making a total of approximately 2.3 million lb. airlifted.

► Latest plane on order in the long-lived Chance Vought Corsair series is a low-level attack plane for the U. S. Navy, which has been designated AU-1, fitted with a single-stage Pratt & Whitney R-2800-83WA engine, instead of the two-stage version used in earlier fighter bombers. Meanwhile Chance Vought also is starting to build a French version of the Corsair, designated F4U-7, under the Mutual Defense Assistance Program. The attack designation of the AU-1, was assigned in a change after the attack plane had originally been designated F4U-6 by the Navy.

► Assignment of Hill AFB, Utah, as storehouse for all F-84 airframe parts for the western half of the U. S., including Alaska and the Pacific, means immediate shipment of some 200 carloads of materials into the post from other Air Force depots. Previously the base had also been assigned as world supply station for the Northrop F-89 Scorpion interceptor.

► Although Air Force will not get first delivery on its Douglas (C-118A) transports until next summer, Navy has just taken delivery of its first three Douglas R6D-1s. One goes to Navy Fleet Logistics Air Wing VR5 at Moffett, another to MATS at Moffett's VR3 squadron and the third is being retained by Navy at Douglas Santa Monica for CAA tests. Both military versions are similar to the commercial Douglas DC-6A cargo planes.

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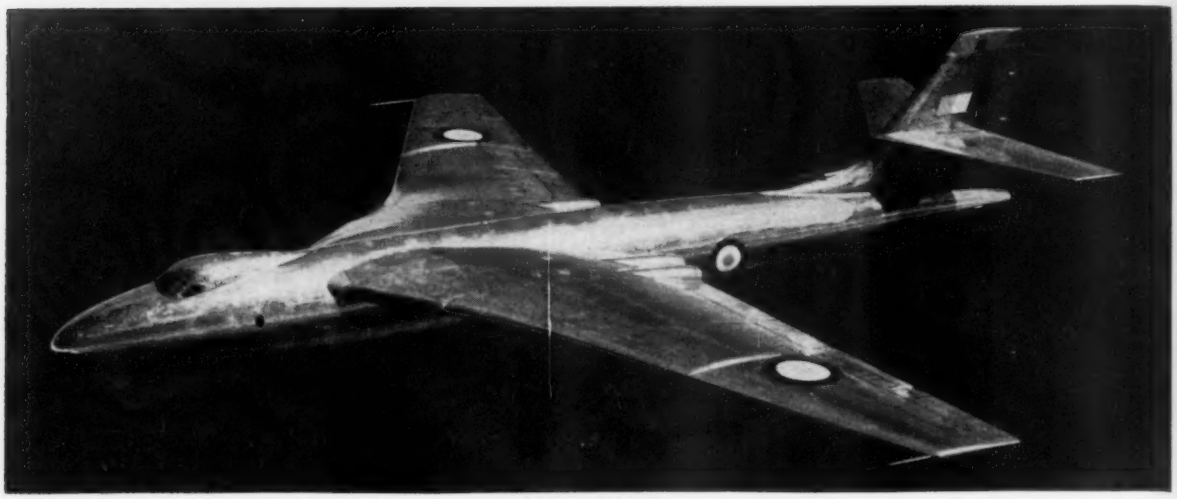


Vickers Valiant

Farnborough Verdict:

Weak Production Handcuffs British Air

- **Public turns out in great numbers to support the show, but supporting the industry is different.**
- **Labor isn't too eager for aircraft employment; wages are low and housing is short.**
- **Yet, if prototypes can become production types, tomorrow should be a far better day.**

By David A. Anderton

London, England—It's difficult to assess the twelfth Society of British Aircraft Constructors display on the spot at Farnborough. A casual observer is overawed by the window-dressing of pilot skill, and the tinsel glitter of aircraft against the patches of blue sky. A critical observer is too aware that there are few new aircraft this year, and that those are prototypes, not production items.

Certainly a better environment for thinking about the display is the damp grayness of a London morning, when you are far removed from the green fields and trees of Hampshire. And it is a help if you have seen a few British factories and talked to a few technicians on their home grounds after the tumult of the show has passed.

Then some of the pieces begin to fall into place, and the jigsaw of British aircraft industry starts to take form.

It isn't too pretty a picture. Production, as we think of it, is small. Service aircraft are obsolescent, with few exceptions. Today's advanced prototypes are two to four years from squadron service.

Light & Shadow

British naval aviation is very weak, say observers. Jet fighter production for the fleet is far behind ours; the first squadron of Vickers-Supermarine Attackers was activated only recently.

And the London Daily Express, Lord Beaverbrook's paper, pointed out—and de Havilland confirmed—that export versions of the Vampire "for certain reasons" were powered with higher-thrust engines than those going to the Royal Air Force.

▶ **Public Support**—Fortunately there is a brighter aspect. Everyone at Farnborough agreed that the prototype aircraft should be world-beaters, when they are in service. And public support of air power is amazing—turnout at the last public day at Farnborough was about 140,000.

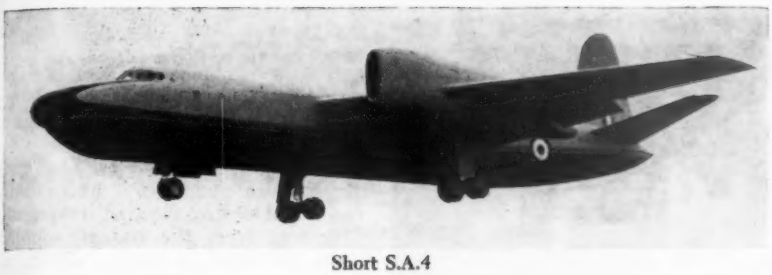
Moral support is considerably different from active support, however. What the aircraft industry needs most is the shot in the arm that would come from increased employment. Right now, the overall employment level is about at one-tenth the wartime peak, and plant managers are concerned primarily with recruiting more labor.

In this they are hampered by several things. Aside from the natural reticence of people to seek employment in what they consider a temporary position, there is little incentive offered Britons to go to work in an aircraft plant.

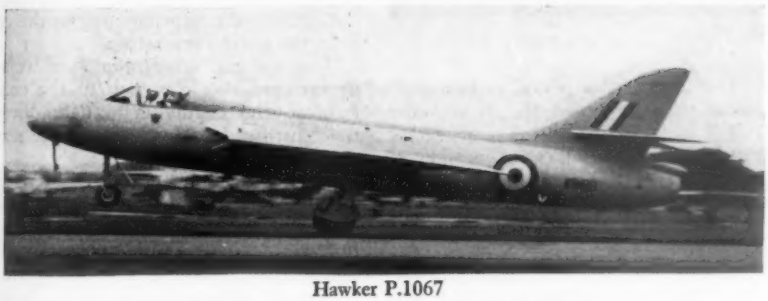
Wage rates are set on an industry-wide contract between management and unions, so that monetary inducements are out. Housing is appallingly short in many of the defense areas. And govern-

Special Report

Dave Anderton of AVIATION WEEK's *engineering department is on special assignment to cover British and European aviation developments. From New York headquarters, he went directly to the SBAC show at Farnborough. His first special report appeared Sept. 17. Here is another, in more detail.*



Short S.A.4



Hawker P.1067

ment direction of labor is politically unwise, if not impossible anyway.

In raw materials, one of the other essentials to an expanding industry, Britain is feeling an occasional pinch. This has affected mostly the production of civil types which, in spite of their export value to Britain's economy, must have a lower priority than fighting craft.

Factory space and facilities are something else. During the recent war, there were great numbers of "shadow" factories built to back up the main aircraft centers of the island. These modern plants are being used only to partial capacity, and have great potential for expansion.

Machine tools are, of course, short. In one case—the Vickers-Supermarine factory at Swindown—there are large cleared areas in the factory layout waiting to be filled with tools on order from the United States. And this is typical of the industry.

▶**Tomorrow's a Better Day**—This is all background which must be understood by those scoffers who liken the British aircraft industry to its French counterpart and say that Britain has a fine prototype air force.

Today, that's true. But tomorrow is going to be different. At least two new planes of great potentialities—the Hawker P.1067 and the Vickers Valiant—have been ordered into production for the RAF off the drawing board. New types are being developed for the Royal Navy to correct the deficiencies in present equipment.

And all through the aircraft industry there is the feeling that "one must get cracking"—get on the ball, in Americanese—with production of current and advanced types.

What are these types? Traditionally, the British have been noted for defensive fighters, tiny interceptors like the Gloster Gladiator, the Supermarine Spitfire and Hawker's new P.1067. And the last war gave them extensive experience in the development and production of medium-range, heavy-load bombers, typified by the Avro Lancaster.

Examples of both those classes of aircraft were what gave the audience at Farnborough a preview of British aviation tomorrow. In the fighter category, these were of most interest:

Fighters

▶**Hawker P.1067**—Without question, this beautiful craft was the star of the show. Its blistering speed (claimed to be around 690 mph. during casual fly-pasts at the show) and extreme maneuverability had the audience gaping. Aside from its gorgeous finish and classic lines, there was little to be seen on the aircraft. Security measures were taken for the first time this year and the P.1067 spent its ground time behind a barrier at the far side of the field, away from the cameras and the inquisitive.

Points noted about the craft were its widespread (for British practice) landing gear, its 15-sec. takeoff run, and its large wing area. It is also believed to have very heavy armament, something on the order of a quartette of 37-mm. cannon.

The plane, like practically every other new design in England, is powered by a Rolls-Royce Avon turbojet, conservatively rated below 7,000 lb. static thrust.

▶**Vickers Supermarine 508**—This butterfly-tailed Swift-Bonanza cross is powered by two Avon turbojets snuggled side-by-side in a wide fuselage. The British claim it to be the fastest and most powerful carrier-based fighter in the world. It certainly should be the most powerful, but it may not be the fastest and it certainly is not yet carrier-based.

The plane has a straight wing to give good deck-handling characteristics. The wing is a thin one, and has droop-snoot nose flaps to aid the conventional trailing edge flaps. Rate of climb, although not satisfactorily demonstrated in flight at the display, should be staggering with the power available. Armament is like the P.1067.

Present in prototype form only, the craft also spent its ground time behind the barrier.

▶**Vickers Supermarine Swift**—One big disappointment of the show was that the Swift, which is competitive with the P.1067, could not appear. It had been belly-landed and was temporarily unserviceable. In its place, last year's hair-raiser Type 535 showed.

The 535 is no mean airplane, but it seemed considerably slower than the P.1067. One interesting phase of its flight demonstration was the use of partial flaps during some very tight turns.

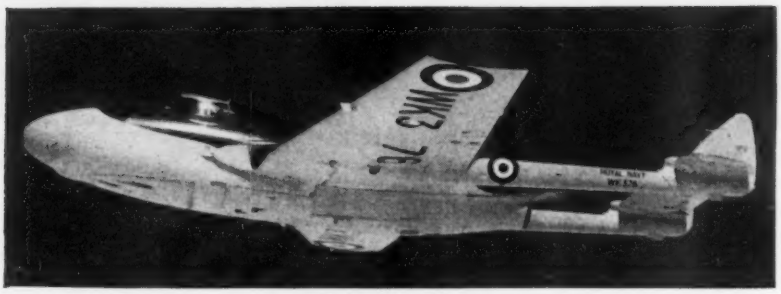
▶**Hawker P.1052**—This little sweptwing plane was shown in a "navalized" version, the basic difference between it and last year's P.1052 being the fitting of arrester gear. The P.1052 is a sweptwing development of the Sea Hawk, one of the Royal Navy's current production types. It would seem that somewhere along the Sea Hawk production line, swept wings could be introduced and the Royal Navy would have an interim fighter of excellent performance.

▶**De Havilland Sea Venom (N.F.20)**—Developed from the well-known Vampire, this all-weather fighter is to be standardized for fleet use by Britain, Australia and France. It was demonstrated at low level by John Derry, whose impeccable flying was one of the memorable events of the show.

▶**Armstrong Whitworth N.F.11**—This craft is one of the many variants of the basic Meteor design (which was laid out to an Air Ministry specification of 1940!) and is going into squadron service as Britain's night fighter. At last year's show the prototype craft was flown; this year, a production version was in the static section.

It was noted that auxiliary tanks are now carried on the wingtips instead of underneath the wing. These tanks have vertical fins on the nose rather than the tail, to guarantee breakaway. Four cannon (presumably 20mm.) are wing-mounted, and are fitted with flash climinators. The bullet fairing at juncture of stabilizer and fin has a sharp nose this year.

To any such listing should be added two widely rumored fighters which failed to make the show. These are



de Havilland Sea Venom

reportedly by de Havilland and Gloster and are tiny interceptors of a class similar to our 1954 interceptor, more pilotless than piloted. De Havilland's design missed the display only by days, according to practically everyone in British aviation circles. Estimates on the Gloster job varied considerably.

(The Air Ministry last week announced the first flight of the "DH 110," presumably one of the planes referred to in this dispatch. Air Secretary Arthur Henderson said the plane is powered by two Rolls-Royce Avon engines and is the first of a new class of day and night fighters.)

And of course the deltas, currently research craft although one was planned as a fighter, must be counted into any advance appraisal of tomorrow's RAF.

Bombers

In the bomber category, there were only two entries, and both were limited in flight performance. Both were flown at considerably below their possible speeds because of restrictions on the airframe. This, incidentally, is not a reflection on the designers, but fairly common practice in Britain. With research means being as limited as they are, the actual proving of an aircraft is apt to lag prototype flights by several months. Until testing is complete, the maneuvers and speed of the plane are restricted to obviously safe limits.

The two new bombers flown at Farnborough this year were:

▶ **Vickers Armstrongs Valiant**—This craft, powered by four Avons, is regarded most highly in aviation circles. Its flight demonstration was smooth and unspectacular; but it did show good climb after takeoff. This is hardly surprising, because the plane was virtually empty. In landing, the Valiant put down a tremendous double-slotted flap of very large chord.

▶ **Short S.A.4**—Someone said this was a Stirling with jets, and there is no way of concealing its lines. But Short has built load carriers before and this may be another terrific hauler. And flight performance was concentrated on manoeuverability of the near-empty plane at extremely low levels.

The Canberra appeared in three different versions during the display—the P.R.3, for photographic reconnaissance, the B.5, a target-indicating version of the standard B.2, and the Sapphire-Canberra, similar to the version to be built by Martin for the USAF under the designation of B-57.

Also demonstrated in flight was the Avro Shackleton, long-range general purpose aircraft for Coastal Command. ("General purpose" might include anti-submarine warfare, convoy shadowing, patrol duties and bombing.)

These four types, together with at least one other four-jet bomber gradually taking shape (this could be the widely rumored Avro delta-winged craft) represent the current and future striking power of the RAF.

Engines

Continued interest in advanced powerplants bore fruit in the presentation of the Napier Nomad, a combination compression-ignition plus gas-turbine engine, and the Armstrong Siddeley Snarler, liquid oxygen-methanol rocket motor.

▶ **Napier Nomad**—This powerplant, which is a combination of a compression-ignition engine and a gas turbine, shows exceptional promise. In its current version, the Nomad has the very low specific fuel consumption of 0.36 lb./hp./hr. at takeoff power; this figure is reduced further for cruising conditions at altitude.

Its primary destiny seems therefore to be economical transportation over long stage distances.

Perhaps the most unusual feature of the Nomad is that the contraprops which are used are not mechanically connected; each half rotates independently of the other.

This feature, incidentally, is what made the engine look as if it were idling during the flypasts. Actually the rear prop was turning at about full rpm, but the forward one was at less than 1,000 rpm. Stroboscopic effect did the rest.

In the Nomad operational cycle, intake enters the side ports, passes first through an axial and then a centrifugal compressor. From the latter the air goes to the cylinders.

Cylinder arrangement is a horizontally opposed layout of twelve, operating on a two-stroke cycle with compression ignition.

The exhaust from the cylinders goes through a turbine which is mechanically connected to drive the axial compressor. Discharge from the turbine supplies some additional jet thrust (320 lb. at sea level static conditions).

Centrifugal compressor is gear-driven from the engine crankshaft.

The turbine drives the axial compressor and the front half of the contraprop; the engine crankshaft drives the centrifugal compressor and the rear half of the prop.

The Nomad is currently rated at 3,000 shp, plus 320 lb. thrust at sea-level static conditions. Burning aviation kerosene or Diesel fuel, its consumption at takeoff is 0.36 lb./hp./hr.

Nomad's dimensions are 126 in. long, 58 in. wide and 49 in. high. Net dry weight of the engine is 4,200 lb.

▶ **Armstrong Siddeley Snarler**—One of several British rocket motors (the Beta was shown last year by the Ministry of Supply and questioning revealed that there was an Alpha), the Snarler was statically displayed at Farnborough together with the Hawker P.1072, its flying test bed.

The Snarler burns a water-methanol mixture as fuel, with liquid oxygen for oxidizer. It is of regenerative type (the fuel is circulated in a jacket around the combustion chamber for cooling purposes) and roughly comparable to one of the four cylinders in the Bell X-1 engine built by Reaction Motors, Inc.

However, the shape of the combustion chamber shows the German influence on motor design. Rather than using the cylindrical layout of high fineness ratio adopted by RMI and other U. S. rocket-motor firms, the Snarler has a short, stubby combustor of two different diameters.

Space requirements of the Snarler roughly approximated a cylinder of 3-ft. diameter and 6-ft. length. Total weight dry is 215 lb., and rated thrust is 2,000 lb.

Transports

The overseas visitor who expected to see something new in transport craft came away disappointed. No new planes were shown; the Comet and the Airspeed Ambassador were statically displayed with finalized interior decor.

The Vickers Viscount 700, ordered by British European Airways and Air France, was flown in the heavy circus which started each day's carousel of planes.

Handley Page's turboprop Hermes V also performed, as did the Mamba-

Marathon, using reverse-pitch props (made by de Havilland) for the first time on any turboprop engine. And the lovely Dove and functional Heron, de Havilland's small transports, showed off their flight capabilities.

Research Planes

So much has been made of Britain's research aircraft, especially the deltas, that little remains to be said. However, the crowd was really scared by two of Falk's takeoffs in Avro's 707B in which he deliberately (said his publicists) banked away after takeoff to demonstrate controllability at low speeds. A far better assessment of slow-speed performance was provided by Falk's flypasts with brakes extended. Observers felt he was below 100 mph. The performance series of aircraft do not have flaps, but rely on low wing loading to maintain high total lift.

Navy Planes

In naval craft, there was nothing really new this year, but excellent flight demonstrations were made of the Westland Wyvern and the Fairey Gannet. The annular inlet to the Python engine on the Wyvern has been moved aft somewhat to expose more spinner and to improve the ram efficiency at the engine inlet. The Gannet appeared in a semi-production guise with the third cockpit added aft, and the wing fences removed.

On the first day, this plane took off with only one of its two contraprops turning over; even at this half-power takeoff, the short distance to unstick was impressive. The British feel that the fleet is really getting a fine anti-submarine plane in the Gannet; as several put it, "We're doing with one plane what you do with two." (This refers to our use of the hunter-killer team of Grumman Avengers or Guardians.)

Fairey also demonstrated their Firefly Mk.7, rigged and being produced as an interim anti-submarine type until the Gannet is in fleet service. In spite of the additive drag caused by external radomes, rockets and sonobuoy containers, the Firefly goes like mad for a propeller-driven, reciprocating-engine craft.

The Lessons

After being duly impressed with all the flight and static demonstrations, the American observer is apt to ask the classic question, "So what?" Trying to answer that one is difficult—about as difficult as trying to explain to the British aviation aficionado why we in the United States bought the Canberra.

Interceptors

►**Interceptors**—Probably the biggest lesson American designers can learn from their British counterparts is the way to design and build interceptors. Now that we have accepted the fact that bombers can get through, we must also accept the fact that either interceptors, guided missiles or anti-aircraft must deal with enemy craft. We have some background in the latter two, but about interceptors we know little. That there is interest in the problem is borne out by the USAF requirement for the 1954 interceptor—but meantime, the British have actual designs flying.

It doesn't take much imagination to see the Fairey F.D.1, which regrettably didn't fly or sit at Farnborough, powered by a rocket engine, and being an excellent example of an interceptor aircraft. Even the Sapphire-Meteor (new engine in old airframe) can outclimb anything we now have.

From this viewpoint alone, Farnborough has much to offer us.

►**Bombers and Transports**—In bombers, we are still worlds apart in thinking. No Briton will admit that the external nacelle is the way to hang a jet engine, and neither will he admit to the tremendous performance of Boeing's B-47.

In transports, the British have a technical lead—this is probably the most recognized truth in aviation today. But operational experience is nil, or nearly so; teething difficulties have kept this transport and that out of service. And the general feeling is that once the jet transport is shown capable of paying its own way, the United States will get into that business so fast that everyone will be left aimlessly spinning in our wake.

►**Engines**—We have thought enough of the Sapphire, Mamba and Olympus to make arrangements for manufacturing these powerplants in the U. S. In rocket engines, we certainly are far ahead of the British. In the use of afterburners, he have surpassed British practice. Closest competition to the Nomad would be the Wright compounded R-3350, and with Nomad development, Wright might have a tough competitor.

U. S. naval craft designers have little to learn, except for the universal acceptance of the turboprop by the British fleet. Presumably development troubles have been keeping us from being abreast of English developments here. And U. S. Navy people in England are intrigued by many of the design features of the Fairey Gannet, although there is no thought of buying the plane.

British research is lagging their building by years, literally. And British production is almost painful to see. These two subjects will be covered later.

So if nothing else, Farnborough can show our people design ingenuity and excellent interceptor craft. It may also underscore the feeling that heavier armament is an absolute necessity on aircraft. And it has made many Americans wish for a counterpart of the SPAC display in the United States.

►**The Big Top**—It is unquestionably the greatest air show on earth, and like the other greatest show on earth, it has its excellent performers, its freaks—and its pitchmen. And it has a few brilliant stars around which the show is built. Those are the performers you go to see, and those you remember.

You can forget the freaks, and discount the pitchmen's spiel, but you can never forget the sight of the Hawker P.1067 blasting past near the 700-mph. mark or the graceful Canberra gliding around the gray cloud base.

SEIBEL S-4B MAKES DEBUT

First flight view of the new two-seat S-4B built by Seibel Helicopter Co., Wichita, Kan., which features more power (165 hp.) than previous models, skid-type landing gear, complete electrical system, including radio and dual controls. The rotor system has been simplified on the basis of experience with earlier types. Note the large clear area behind the cockpit for stowing cargo or stretcher cases. By employing automotive and industrial gears and bearings, Seibel says it has been able to keep costs down.

New Hope For Standard Lighting

Uniform international pattern for major airports is aim of Washington and New York conferences.

U. S. and foreign specialists on aircraft landings in bad weather will again try for a single international standard for approach lighting at major airports this week and next.

International conferences on approach lighting will take place at Washington and New York. They will be accompanied by comparative flight test demonstrations at Newark Airport and the Naval Air Test Station, Patuxent River, Md., and by movies and lectures.

U. S. inter-agency differences over what pattern shall be used to lay the lights on the ground have blocked standardization for five years.

▶**Which Pattern?**—Most analysts of the problem agree that standardization on almost any one pattern is more important than which pattern is used. Britain settled the problem long ago with a simple centerline of lights with crossbars, and U. S. airline pilots generally favor a similar system.

▶**Situation Snafu**—The U. S. Air Force, Navy, CAA and airline pilots have been unable to agree among themselves on a single approach light system. So each year they've had to ask other countries to wait another year before discussing an international standard.

CAA finally abandoned its earlier insistence on a "slopeline" system and for a year now has awaited Air Force-Navy-airline pilot agreement. Navy engineers cling to slopeline. Airline pilots want centerline.

An Air Force directive requiring a cleared zone 1,000 feet out from each end of the runway, with not even a stick standing, has been an obstacle to agreement. This is to help prevent bad crashes with obstructions on overshot landings or undershot approaches. Air Force has said its clear-zone rule forbids any approach lighting inside the 1,000-ft. zone. That automatically prevents AF acceptance of either of the leading two approachlight systems—centerline and slopeline.

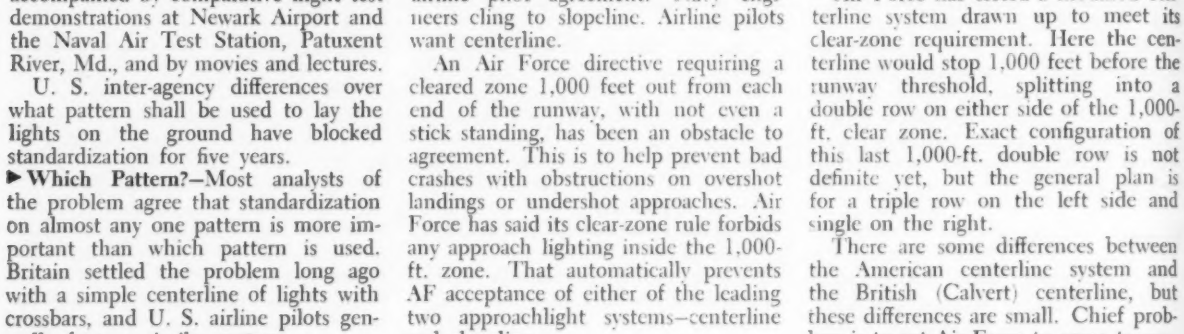
Result is that U. S. airports have an assortment of systems—slopeline, left-hand row, centerline, and various modifications of each. France has a modified left-hand row system. The British has settled on centerline, whose principle U. S. airline pilots and the majority of the IATA flight technical group agree.

▶**Settlement Possible**—The next two weeks may bring the beginning of order out of five years' chaos. One compromise possibility shows some promise of acceptance.

That is centerline lighting at all transport fields, and modified systems at U. S. military tactical airfields.

Air Force has tested a modified centerline system drawn up to meet its clear-zone requirement. Here the centerline would stop 1,000 feet before the runway threshold, splitting into a double row on either side of the 1,000-ft. clear zone. Exact configuration of this last 1,000-ft. double row is not definite yet, but the general plan is for a triple row on the left side and single on the right.

There are some differences between the American centerline system and the British (Calvert) centerline, but these differences are small. Chief problem is to get Air Force to agree to centerline arrangement system at transport airports.



BRISTOL ROLLS OUT ITS TWIN-ENGINE COPTER

First photos of the tandem-rotor Bristol 173 taken during run-up tests at the British company's factory reveal its similarity to U. S. Piasecki designs, and also indicate a promise of a roomy interior. Powered by two Alvis Leonides 550-hp. engines, the craft will carry 10-14 passengers and cruise at 105 mph. with a gross weight of 10,600 lb. With rotors folded, length is 78 ft., width, 17 ft. Rotor diameter is 48 ft. (Aviation Week May 7, p. 21). BEA intends to put one 173 in experimental service by 1953.

Slick-AF Test

• Air Force buys service patterned after successful Navy contract deal.

• But AF moves cautiously; it is starting with only a westbound charter run.

Slick Airways has started operating an exclusive Air Force charter run calling for three all-cargo flights a week westbound only from San Antonio to San Francisco.

This new charter run is an experiment that may lead to an Air Force contract for an operation similar to the daily Navy-Slick transcontinental cargo run analysed in AVIATION WEEK June 11, p. 12.

Normal route of the new Slick-Air Force supply runs San Antonio, El Paso (gas), San Diego, Burbank (gas and crew change), Sacramento, to Oakland or San Francisco.

▸**One-Way Run**—Chief difference between this and the large-scale Slick-Navy operation is that the Air Force traffic here is one way. And for the time being it is charter rather than long-term contract. Air Force traffic is mostly west from San Antonio to embarkation San Diego and Oakland/San Francisco.

Slick bid $1,196.30 per one-way flight San Antonio to San Francisco via San Diego. Next closest bid was $2,385.60 by Flying Tiger Line. Slick is in the best position as a carrier with plenty of common carriage moving back from the West Coast to Texas to make the one-way Air Force charter Texas-West Coast pay on a strictly one-way fare. Flying Tiger and others had to figure on deadheading planes east most of the time.

The thrice-weekly charter is at the published standard charter rate of 70 cents a plane mile. Slick uses 13,000-pound-payload Curtis C-46 aircraft. So if Air Force utilizes almost all the space available on the scheduled westbound C-46 flight, the ton-mile rate will be 11-12 cents a ton mile, depending on space utilization.

▸**Decision Expected**—In about 90 days, Air Force Transportation Office expects to know for sure whether to adopt the west-bound commercial all-cargo operation under long-term contract. The day-by-day charter was adopted first to make sure the commercial air cargo operation pays. Three times a week is all the commercial service AF felt necessary now.

But if an increased mobilization or emergency tempo required more of Military Air Transport Service's planes, then the charter or commercial contract weekly frequency would multiply. If, as is expected, the experiment leads to scheduled commercial contract operation, the contract will probably specify increased carriage in case of mobilization.

Right now, MATS takes much of the San Antonio westbound Air Force cargo. But MATS does not operate scheduled service. Hence the apparent need for the Slick operation.

Potential volume will be a question of how much regular MATS cargo capacity moves each week from San Antone to the Coast.

The deciding figures on efficiency and comparative cost will come from the next 2-3 months' trial. Last week, Maj. Gordon Haines, chief of the Air Force commercial air cargo branch, returned to Washington after helping set up the new Slick-AF charter for its first week of operation. Now he and other AF transport officers await efficiency reports and cost data.

House Unit Approves AF Base Expansions

House Armed Services Committee has approved Air Force plans for three major base expansions.

McGuire AFB, Wrightstown, N. J., $50,972,000, for use as the Atlantic terminal for Military Air Transport Service, now at Westover AFB, Mass.

Travis AFB, Calif, $18,801,000 for B-36 bomber wing base.

Sioux City Airport, Ia., $1,746,000, for all-weather fighter interceptor wing.

The expansions would include additional fuel storage and dispensing facilities, communications and navigational aids facilities, aircraft maintenance, training, and troop facilities.

After the authorizing legislation is enacted, funds must still be obtained before the $71,519,000 program can move forward.

'Down Under' Pact

(*McGraw-Hill World News*)

Melbourne—Reciprocal air services between Australia and The Netherlands has been agreed to by the respective governments. The pact is expected to be signed shortly.

The Dutch secured Australia's consent to operate between Holland-Australia, Australia-Dutch New Guinea and between Dutch New Guinea and the Australia territory of Papua and New Guinea.

KLM Royal Dutch Airlines is expected to start a regular weekly service near the end of this year between Amsterdam and Sydney, via Biak in Dutch New Guinea.

What SBAC Group Intends to See

Members of the Society of British Aircraft Constructors were scheduled to attend a formal luncheon at the Pentagon today as the opening event in their month-long tour of American and Canadian aircraft plants (AVIATION WEEK, Oct. 1, p. 17).

Following the luncheon, at which the Air Force and Navy were co-hosts, the group was to tour the nation's capital prior to a formal dinner in which visitors were to be guests of Air Chief Marshal Sir William Elliott.

The itinerary:

Oct. 8—Washington, D. C.; Oct. 9—Fairchild and Martin; Oct. 10—Curtiss-Wright and Bendix; Oct. 11—United Aircraft (Group A), and Grumman (Group B); Oct. 12—General Electric (Lynn); Oct. 15—Alcoa and Thompson Products; Oct. 16—Wright-Patterson AFB; Oct. 17—McDonnell (Group A), Allison (Group B), and Westinghouse (Kansas City); Oct. 18—Consolidated Vultee; Oct. 22-25—Plant visits in Southern California area; Oct. 26—Edwards AFB; Oct. 29—Boeing Seattle; Oct. 30—Vancouver; Oct. 31—Calgary.

Nov. 1—Winnipeg; Nov. 2—Toronto; Nov. 3—Montreal; Nov. 4—New York.

AF to Study Sources Of Air Cargo Damage

To find out where damage to air cargo occurs, Air Force's Air Material Command has ordered 15 impact recorders from Impact-O-Graph Corp. of Cleveland.

The shipper conceals the impact recorder gadget in a package. When the journey is over an inspector has a time-series graph of the bumps the package suffered throughout the trip. He can then figure just where each bump occurred, by checking the time against the shipment route schedule. The Impact-O-Graph recorder fits in a metal case 9 x 9 x 5 in.

Airlines tried this trick out about two years ago in 15,000 miles of tests, in cooperation with the Porcelain Enamel Institute and Westinghouse Electric & Manufacturing Co.

BCPA Earnings

(*McGraw-Hill World News*)

Melbourne—British Commonwealth Pacific Airlines is pleased over its successful financial operation for the past fiscal year, which showed a 28% increase in number of revenue passengers flown, for a total of 13,976. Air cargo figures also were up.

Revenue for the last fiscal year was up to $5,288,404 compared with $2,804,956 for the previous fiscal year.

As a result of these improvements, BCPA is considering buying some new planes.

SIGNS POINT to no easy solution at Wright, but picture is brighter elsewhere.

Strikes Tying Production in Knots

Aviation executives, immersed in the problems of expanding defense production, last week were deep in the throes of another struggle that threatened to throw their finely geared schedules off kilter—the swelling tide of labor disputes affecting nearly all segments of the industry from prime manufacturer to supplier. About two dozen firms had approximately 900,000 workers idling.

CIO-affiliated unions were causing the major part of the ruckus. And for the hardest hit of the primes, Wright Aeronautical Corp., at Wood-Ridge and Garfield, N. J., shut down tightly since Sept. 27, there seemed to be no early or easy solution, although federal mediators John Fenton and Frank Brown were under orders to work day and night until the situation was straightened out.

More than 12,000 WAC employes were out; some 9,800 production workers and approximately 3,000 white-collar works who contributed to the shutdown by refusing to cross picket lines. About 2,000 additional construction workers, affiliated with AFL, also respected the pickets.

The major issue appeared to be the production workers demands for higher wages, increased pension and other benefits—yet the issue being debated in newspaper advertisements by each side was the new cafeteria setup at Wright, which the company wants handled by an outside industrial feeding firm. The union wants to be recognized as the bargaining agent for the cafeteria contractor's employes.

Among the other firms working on knotty labor relations problems last week were:

- Pratt & Whitney Aircraft's Southington, Conn., plant, where 1,800 production people went out when IAM turned down extension of East Hartford's contract to cover the Southington facility. Prospects for settlement here looked good early last week when workers started trickling back while federal and state conciliators worked on the settlement.
- Douglas Long Beach and Santa Monica, where a total of 8,100 workers have been out since Sept. 5 and Sept. 12 respectively. UAW here is seeking automatic wage progression, has rejected a company offer of an escalator wage clause and straight hourly wage boosts.
- BG Corp., at Ridgefield, N. J., where International Brotherhood of Electrical Workers threw up picket lines Aug. 14. Deliveries have been slowed because sympathetic truckers union will not cross the lines.
- Ec-Cell-O Corp., Detroit, Mich., piston and jet engine parts maker, which had about 3,000 workers out since Sept. 12, appeared to have reached a settlement early last week, when workers were scheduled to ratify an agreement reached between the company and the union.

Other firms were peaceably ironing out wage boosts. At Ryan Aeronautical a 4% increase went into effect for approximately 830 hourly paid and salaried employes and some hourly paid electrical maintenance workers. However, UAW-CIO and the United Aircraft Welders unions turned down the increase, indicating they were wary of accepting any boost which might jeopardize increases which may be negotiated when contracts are renewed this month.

Wage Stabilization Board unanimously approved an approximate 13-cents-hourly increase for 23,000 workers at Lockheed plants in the Los Angeles area. And Air Associates came out with a 12-cents-an-hour increase for some 1,000 employes at three plants in New Jersey, supplementing the contract the company has with UAW-CIO Local 201. The boost was ratified by the union.

NAL Management Beats Opposition

While the oppositon slate managed to place three members on the Board of National Airlines, the management group headed by G. P. Baker won a clear-cut victory at the annual stockholders meeting held Sept. 27 (AVIATION WEEK Sept. 10, 1951, p. 16 and Oct. 1, 1951, p. 19). Management's margin in the voting was about 2-1.

The management group elected eight members to the board and will clearly be in command of company policies. More importantly all management sponsors' proposals were adopted by stockholders. In the forefront was the abolition of cumulative voting which permitted the opposition slate headed by William K. Jacobs, Jr., to elect three members to the board. At the next stockholders meeting, with the absence of cumulative voting, the management will be in a position to name the entire board unless the opposition can muster considerably more proxies.

Jacobs has indicated that the result of the meeting on cumulative voting will be challenged in the courts. But informed observers believe that this will prove to be a futile action.

Viscounts Canceled

Melbourne—Orders for six Vickers Viscount turboprop airliners have been canceled by the Australian National Airline Commission because the government has refused to permit kerosene fuel needed to operate the planes to enter the country duty-free. ANAC has not yet decided on replacements for the Viscounts.

WHY SODIUM COOLED VALVES LAST LONGER

FIG. 1

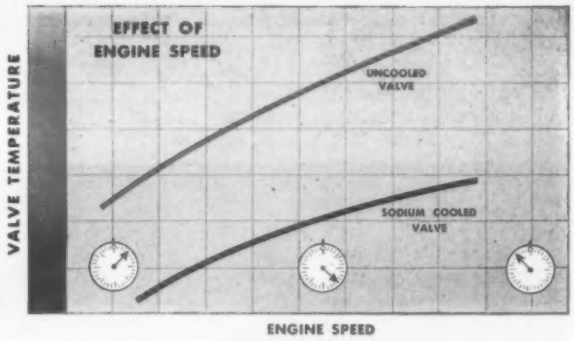
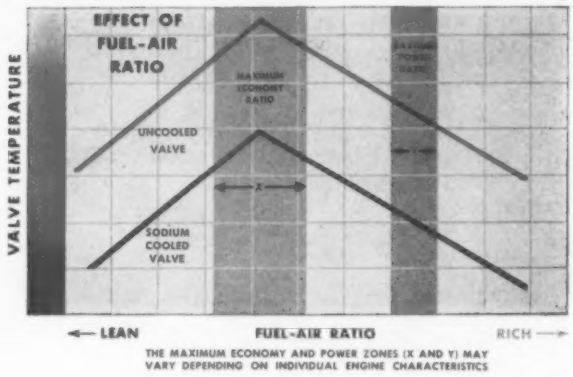


FIG. 2



THE MAXIMUM ECONOMY AND POWER ZONES (X AND Y) MAY VARY DEPENDING ON INDIVIDUAL ENGINE CHARACTERISTICS

The trend in modern engine operation is toward higher speeds and more economical fuel-air ratios, resulting in higher temperatures for many operating parts.

Higher temperatures of exhaust valves, for instance, are the dominant factor limiting valve life, sharply reducing the valve material's resistance to corrosion and distortion, and definitely limiting its life under fatigue conditions. Reducing valve temperatures, therefore, lengthens valve life amazingly; this is best accomplished by internal cooling as shown in the accompanying graphs based on recorded test data.

Fig. I shows effect of internal cooling of valve over the engine speed range. Fig. II shows lower valve temperatures of the sodium cooled valve for various air-fuel ratios.

Eaton engineers will be glad to work with you in applying the benefits of sodium cooled valves to your engines.

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FINANCIAL

McDonnell Adjusted Operating Results

	Year Ended June 30		
	1950	1951*	1951**
Sales	$38,688,383	$42,623,014	$66,623,014
Earnings after taxes	2,815,219	2,491,262	3,291,462
Earnings per common share	$4.13	$3.66	$4.82

*As adjusted to conform to 1950 accounting method.
**As reported by company under changed accounting method.

Up or Down? It Depends on Angle

McDonnell accounting switch, including accrued earnings on undelivered work, distorts comparison with 1950.

With its fiscal year ending June 30, McDonnell Aircraft Co. is the first major aircraft builder to report its annual results for 1951. The company's annual report assumes added significance in that it affords a measure of aircraft production for the first full year following the outbreak of the Korean war.

As reported to stockholders, McDonnell shows total sales of $66,623,014 for the year ended June 30, 1951. Net earnings for the current year were indicated at $3,291,262 or $4.82 per share.

This is a substantial improvement over the 1950 fiscal year sales of $38,688,383 and net earnings of $2,815,219. However, the 1951 results reflect a major change in the accounting method used which distorts comparisons with 1950.

▶**Accounting Change**—In the past, McDonnell did not include earnings on long-term contracts until completed units were delivered, with incentive-bonus being carried to income upon completion of the contract. With its 1951 fiscal year report, the company includes in current earnings accruals on a percentage-of-completion as work progresses.

In other words, profits have been anticipated on contracts before all completed units were delivered. This change had the effect of increasing sales for the 1951 fiscal year by about $24 million and net earnings after taxes, by $800,000.

The accompanying table shows the main elements of McDonnell's 1951 results on the new basis as well as adjusted to the previous method to afford a like comparison with 1950.

It becomes evident that instead of 1951 sales having an indicated gain of about $28 million or 72%, the increase was actually less than $4 million and slightly more than 10%. Moreover, on an adjusted comparable basis, net earnings after taxes for 1951 were actually lower than for 1950—$2,491,262 as against $2,815,219.

Moreover, it is possible that faced by higher income taxes for 1951 as proposed by Congress, the McDonnell management decided to include as much earnings as feasible during the period ended June 30, 1951, so as to benefit from the relatively lower existing tax rates.

▶**1951 Pattern?**—**It is very significant that despite the continuing build-up in aircraft procurement, actual production has been slow to show any appreciable gains. This is reflected by the very nominal gain of less than $4 million in McDonnell's 1951 production over its 1950 fiscal year.**

This may well indicate a pattern to be repeated in the 1951 annual reports of other aircraft companies. In fact, this trend has been pronounced in the semi-annual accounts released by a number of major builders. This condition is attributed to the delays incident to lead time in starting production on new aircraft designs. More frequent recently, however, have been industry reports of "slippage" in maintaining aircraft production schedules.

Despite its more moderate gains in sales and lower earnings for 1951, as adjusted, McDonnell continues to reflect considerable progress. A better than average accomplishment is shown in profit margins with the 1951 adjusted figure being 5.82%, compared to 4.94% shown on the augmented sales under the new accounting method. For the 1950 fiscal year, ratio of earnings after taxes to sales was 7.28%. For last year the industry average was slightly better than 3%.

▶**New Facilities**—A major change in the complexion of the company's assets also took place. McDonnell arranged to purchase from the City of St. Louis for $9,873,093 the main portion of the plant at the Municipal Airport. Under the terms of the contract, the company paid $1 million on July 31, 1951, and delivered its 2% note covering the balance which is payable in monthly installments over the next ten years.

It is noteworthy that the company received a certificate of necessity to the extent of 70% on the purchase price of the plant. In other words, 70% of the cost of the plant will be written-off within five years while payments will continue over a period of ten years.

McDonnell has undertaken a facilities program entailing capital expenditures of $17,513,486. This includes the purchase of the plant from the City of St. Louis, a new $3.5-million flight test hangar, and $2 million for wind tunnels. Certificates of necessity cover this entire program.

On June 30, 1951, McDonnell's unfilled backlog amounted to $278.6 million, the highest in its history. To help finance its production program, the company arranged for an $11-million four-year bank credit agreement.

▶**Net Worth Gain**—Further improvement in the company's balance sheet position is evident in the gain of the net worth position to $10,769,854 as of June 30, 1951, as compared with $7,623,881 a year earlier. Stated in terms of the existing common stock, this gain is best expressed by the rise in the book value per common share from $1.87 at June 30, 1946, to $15.80 at June 30, 1951. (Adjusting to remove the gain resulting from the current accounting method change would reduce the 1951 valuation to $14.64.)

The effect of the company's two-for-one stock split of September, 1950, is reflected in the broader ownership interest. At June 30, 1950, there were only 1,296 stockholders. A year later this figure was increased to 2,395, almost double. Regular dividends of $1.00 per share were paid on the common stock during the past fiscal year with the same quarterly disbursement of 25 cents indicated for this year.

Some dilution will occur when the president of the company exercises the remainder of his warrants at $5 a share. A total of 38,480 shares will thus be issued at about one-fourth the existing market price.

There have been informal reports that McDonnell will seek to have the company shares listed on the New York Stock Exchange. This will serve to further broaden investment interest in McDonnell's securities. —Selig Altschul

Joint Group Tackles Engineer Shortage

● Industry and military told what to do for future.

● But no immediate relief in sight for today's problem.

● So industry still can use over 50,000 more right now.

By Irving Stone

The critical shortage of engineers is sticking out like a sore thumb on the otherwise mighty fist of American industry.

And the gloomy picture is that this deficiency is going to get worse before it gets better—if it does—in the next 10 years.

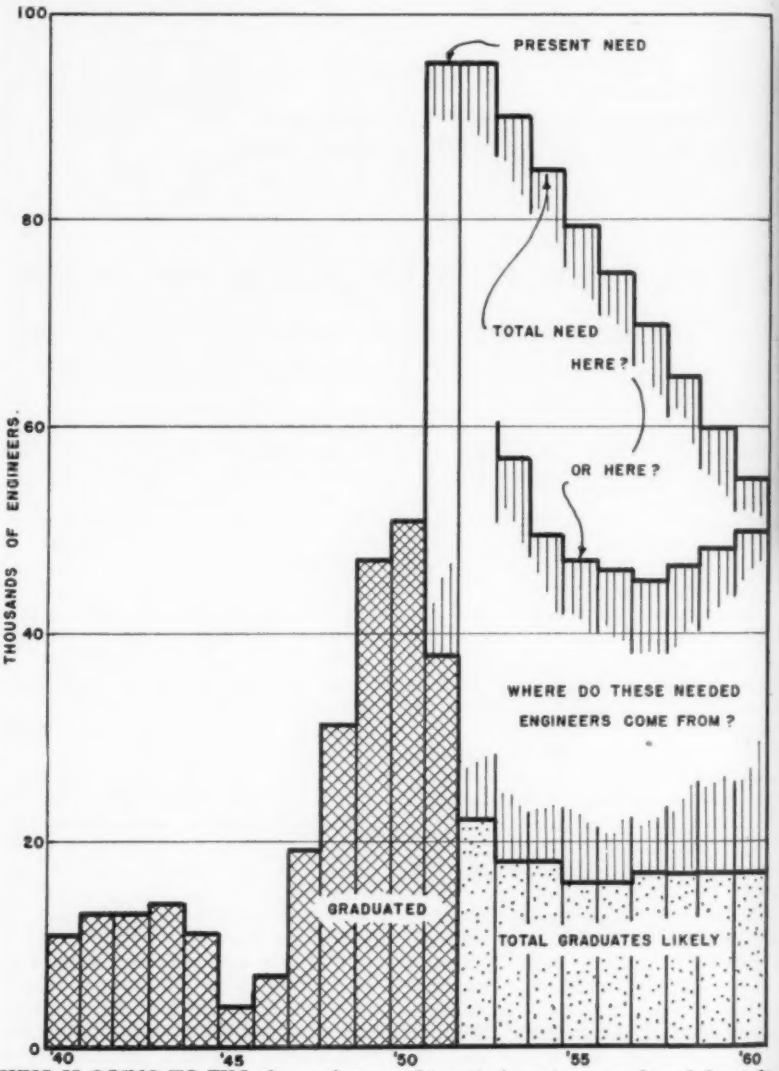
Probably like no other industry, the aircraft effort and allied phases use a widely diversified engineering group encompassing a broad field of specialists—not only from an aeronautical category, but also from physicists and the ranks of mechanical, electrical, chemical and civil engineers. For the "aircraft industry," therefore, the situation is especially acute (AVIATION WEEK May 7, p. 26).

The Engineering Manpower Commission of the Engineers Joint Council gathered a group of industrialists, educators and engineers at Pittsburgh, Pa., last month to discuss what must be done to maintain and increase the national supply of engineers for civilian economy and also for the armed services.

► **Picture Now**—The situation that confronted this convocation is tersely set forth in the accompanying chart. This was contained in the Commission's Aug. 29 newsletter and interpreted in the light of the latest looks at supply and demand and the steps to be taken to put government and industry engineering talent to better use.

The chart was prepared by C. S. Hollister from data compiled by the U. S. Bureau of Labor Statistics, U. S. Office of Education, American Society for Engineering Education, and the Engineering Manpower Commission. Hollister, a member of the Commission, and dean of Cornell's College of Engineering, presented a paper at the meeting, reiterating in substance the newsletter data previously mentioned.

The graphic representation sweeps the past and probes the future. As Hollister points out, the operation of the draft in the war years had the effect of taking all able-bodied men out of the engineering schools. Thus, during that time the schools were not educating engineers at the normal rate.



WHO IS GOING TO FILL the gap between this nation's engineer supply and demand?

Hollister claims that the U. S. was the only belligerent country on either side of the conflict that followed this policy. This means that men who should have been graduated in those years are sorely needed in the present emergency—but they aren't available.

However the G. I. Bill helped boost the number of engineers graduated from the schools up to this past June.

Graduates that may be expected in the future—to 1960—can be closely estimated because those who will come out between now and 1956 have either entered or applied for admission in the country's engineering colleges.

► **High School Factor**—Percentage of high school students now entering engineering colleges is about 20% less than during the prewar years. Hollister observes that it isn't likely there will be any substantial increase over the total number of engineering grad estimate for the next decade, because high schools aren't expecting to boost by

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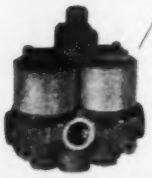

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any large amount the numbers graduating, until the end of that time.

The numbers expected to graduate from engineering schools, as shown on the chart, is based on the total anticipated enrollment—without allowance for draft or reservist withdrawals. Obviously, if engineering students are called into service, the graduate estimate will slide.

▶ **Demand Exceeds Supply**—Last June, the Commission published the results of a survey of industrial and governmental need for civilian engineers. This indicated that 80,000 were required as of June 1. An additional 15,000 were needed by the armed services. Shown on the chart, the total is 95,000. To meet this need was a class of 38,000. And half of these, says Hollister, are or will be with the armed forces.

The need next year is not likely to drop. Thereafter, it may taper off, but how sharp the drop will be will depend on what action government and industry takes.

These requirements, Hollister says, are in keeping with the ordinary patterns in which engineers are used. But the percentage of those beginning engineering studies is far below those needed—before the war nearly 6% of boys graduating from high school entered engineering colleges; now the rate has dropped to 4.8%. About 10% would be needed to meet peacetime civilian needs alone.

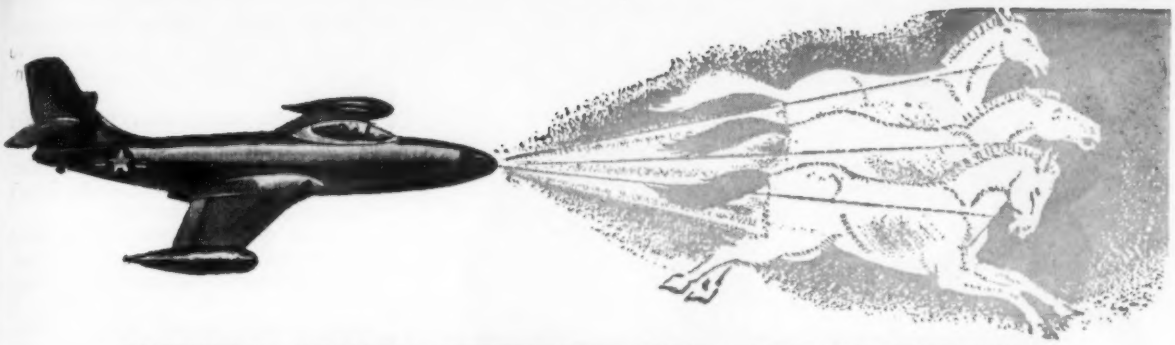
Thus, the use-pattern must be greatly modified if the present engineering task is to be done with the limited number available.

▶ **Recommendations to Industry**—This is what the Commission recommends for industry:

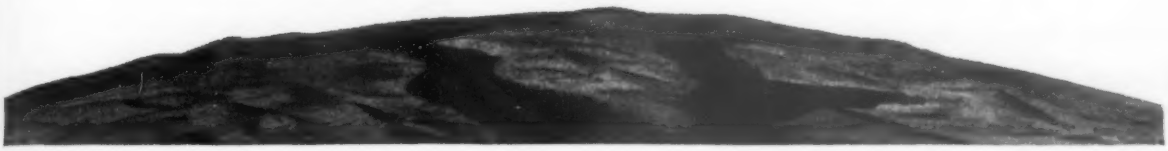
- Use engineers only in jobs in which engineers are required.
- Do not hold young engineers in "intern" positions longer than necessary to qualify them.
- Move engineers to positions of maximum responsibility compatible with ability and experience.
- Release engineers from positions not requiring engineering training.

▶ **Recommendations to Military**—The Commission's recommendations to the military:

- Engineering specialists in critical engineering positions in the defense effort should not be called to duty regardless of reserve status.
- Engineers should be assigned only to duties involving capacity use of their technical training and experience either through the draft or the reserves.
- Reservists in enlisted ratings whose subsequent training qualifies them as engineers should not be called and used as enlisted personnel, but used in assignments which must be filled only by engineers.
- Reserve officers whose subsequent



TAKING MORE WEIGHT OFF THE "HORSES"



through

MAGNESIUM

How high, how fast and how far today's airplane flies depends on its "horses"—*and its weight!* Just increasing horsepower isn't enough . . . lowering the weight-to-horsepower ratio by decreasing the weight of the engine is just as important. The power plant of the modern aircraft contains less weight per horsepower than ever before. Weight has been taken off "horses" with magnesium, the world's lightest structural metal.

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training qualifies them as engineers should, if recalled, be assigned only to duties which require engineering training.

That's the conservation viewpoint for this emergency period.

► **Drawing Power**—But there's another facet that many engineers believe hasn't received sufficient attention.

Should this emergency be resolved but another arise in the next 20 years, it is doubtful if the engineering supply will be any less critical than it is today, considering the tempo of technological progress and the huge technical manpower required to translate these advances into enormous mass production schedules.

The gist of the problem seems to many in the profession to be that of getting enough students into engineering colleges. In basic terms this means making engineering sufficiently attractive to the high school graduate—as a profession and from an economic viewpoint.

Selling engineering as a profession may not prove difficult because it carries a strong appeal to the creative sense latent in many young students. Another strong factor is the growing relation of engineering effort to the broad cross-section of consumer products in this country.

Selling the profession from the economic angle appears to be a stumbling block. This isn't true in today's market for engineers, but one frequently hears from graduate engineers and college students studying for other professions that "normal" requirements in the field of engineering do not absorb available talent, forcing technical manpower into other fields of work.

Boiled down, a wide consensus among engineers is that in times of national emergency, they are premium employes; in peacetime it's rough on a broad segment of them—job-wise and salary-wise.

► **Balance**—From the viewpoint of engineer utilization, the aviation industry represents an extreme consumer of manpower.

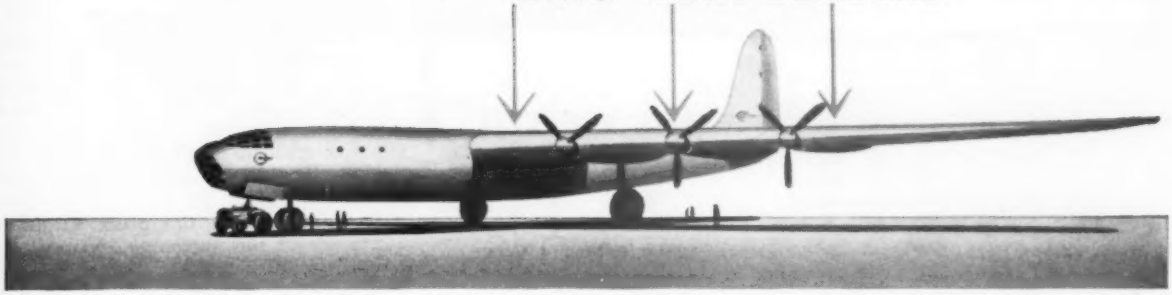
It can't get enough technical help in periods such as these. But many engineers feel that in "normal" times, when the industry isn't deluged with military contracts, its engineering manpower demands are relatively small.

What the picture will be after this emergency is highly conjectural. But government and industry planners can learn a lesson: They must make it possible, many feel, to absorb a steady flow of technical manpower into the peacetime phases of this progressive era if they expect to have a cushion when an emergency expansion hits them.

If a place with adequate recompense is established, the would-be-engineer, like any other man, will go for it.

GOVERNMENT SPECIFICATION

INTEGRAL WING TANK SEALERS



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In Korea, battle wounded often reach a hospital faster than a traffic accident victim in metropolitan cities.

Combat records show that combat casualties have been evacuated by helicopter to a batallion or regimental hospital within 20 minutes after being wounded. This remarkable "ambulance" service is the contribution of helicopters such as the H-13D and the HTL-4, built by Bell Aircraft for the Army, Navy and Marines.

These maneuverable Bell helicopters are officially credited with saving the lives of 3,000 wounded U. N. troops in 6 months.

The majority were wounded so critically that evacuation by any other means could have been fatal.

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'Beauty' Treatment For Stratojet's Skin

Boeing Airplane Co. is making sure that aluminum alloy sheet used for the B-47 Stratojet's skin meets the high standard of aerodynamic cleanness required for this fast bomber.

It was no secret that skin imperfections could measurably cut the top speed of the modern, jet aircraft, so Boeing wanted to insure that the thin coating of corrosion-resistant, near-pure aluminum on the aluminum alloy sheet would be protected from time of warehouse receipt to the end of the production line.

What was wanted was a skin covering that would resist surface damage from sliding one sheet over another, flying chips, heat-treat, deep drawing, pneumatic hammer operations, and other fabrication processes. Studies by Boeing's process labs and consultation with Minnesota Mining and Mfg. Co. resulted in Orange Dye No. 968 —a liquid spray applied with a giant atomizer.

First coat of this plastic lacquer is made at the warehouse. New lacquer is applied before and after each manufacturing operation and the result is a final smooth skin. Removal of the lacquer is easy, the coating peeling off like tape.

Modified Camera Takes Dual Record

Mechanical and oscillograph records may be made simultaneously of a subject under test by modifying Kodak or Eastman Type III highspeed cameras to take a second lens at 90 deg. to the normal lens. Both records are made on the same film.

Since the film travels vertically, the horizontal deflecting circuit alone is used. The film speed, indicated by the edge-marking argon lamp in the camera, provides a time base if necessary. Exposure of the oscillograph trace is continuous, and on any given picture frame, the midpoint from top to bottom of the frame represents a time interval equal to the reciprocal of the picture frequency. This is five times the picture exposure time.

The trace may be placed any desired distance within the width of the picture field, where it will not conflict with the subject being photographed. An oscillograph providing a total accelerating potential of 10 kv. or higher is recommended for use with the camera.

The camera modification can be added to Kodak highspeed cameras or Eastman highspeed cameras Type III at a charge of $500 plus cost of the extra lens.

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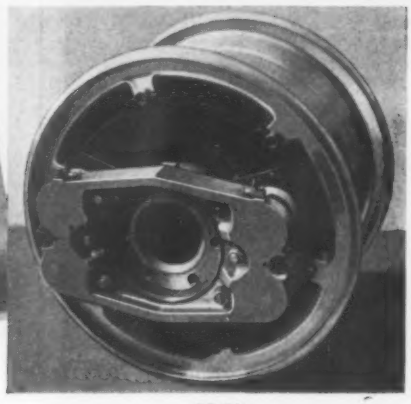

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2) **Type of landing gear desired**
3) **Take off and landing weights**
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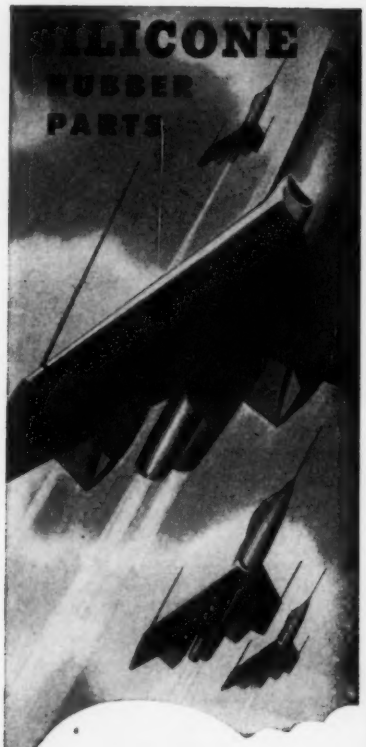

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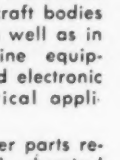

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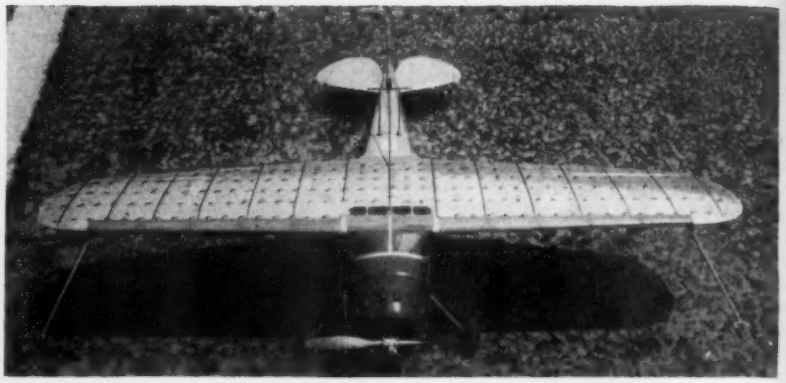
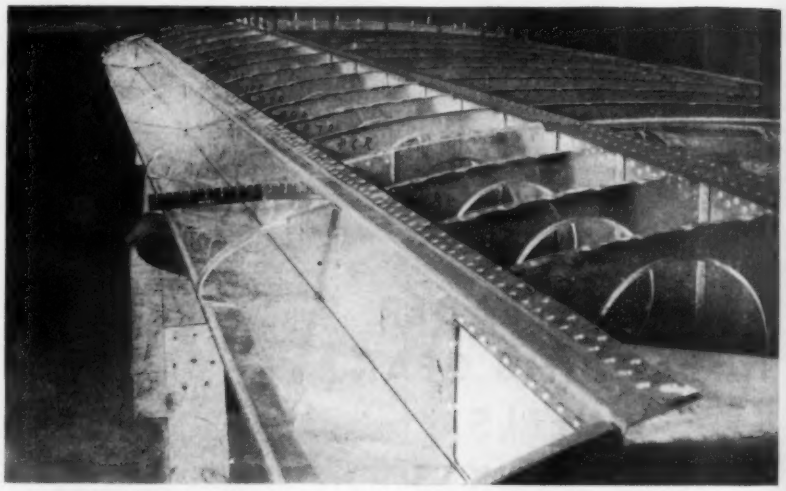


WOOL TUFTS on wing "paint picture" of air flow, which camera records.



SUCTION DUCT runs the entire length of the leading edge of the right wing.

Porous Skin Cuts Stalling Speed

Boundary layer turbulence at low speeds is reduced by suction through perforated metal wing leading edges.

The aircraft speed band is like a heavily tensioned cable. It is being pulled at both ends but it stubbornly resists stretch, yielding only by small increments.

While jet-, turboprop-, and rocket-powered planes are being extended toward their upper-limit speeds, researchers are busily ferreting out the aerodynamic secrets for pulling back on the lower end of the speed band.

National Advisory Committee for Aeronautics engineers are broadening their studies to reduce stalling speeds and improve stability characteristics at these low values for safer landings. Results of this research may mean greater safety for fast military planes and future jet airliners.

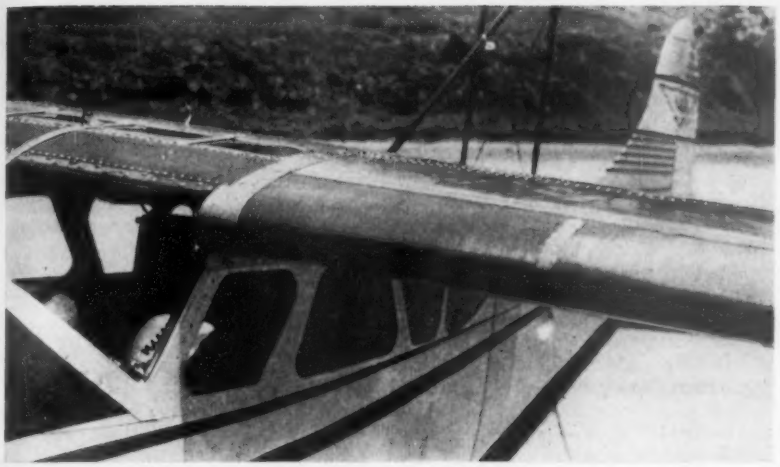
NACA has experimented extensively with flaps, slots, slats and other methods of reducing the minimum safe speed of aircraft. One of the approaches has been in the windtunnel with research on boundary layer control by suction.

▶**Test Vehicle**—Now, Langley Laboratory engineers are supplementing this study with actual flight trials in a specially fitted aircraft. This is a conventional high-wing personal plane modified to incorporate a skin of porous metal along the leading edge of each wing.

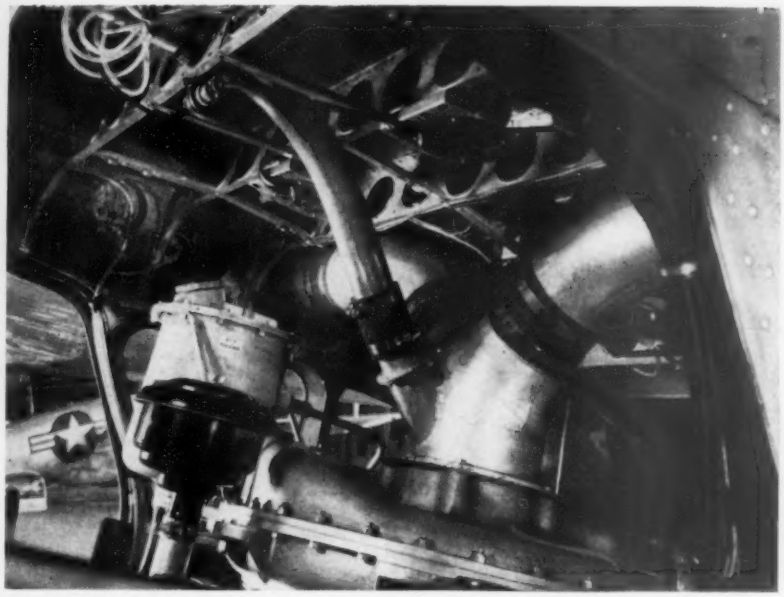
Ducts behind the leading edge are connected to an exhaust system that sucks air through the porous skin. At low speed, the suction reduces turbulence, inducing a smooth flow of air over the wing to increase lift and delay the stall.

This application is believed to be the first time porous metal has been used for boundary-layer control tests with a flying plane.

Although the experimental work is being done with a small plane, there is



PERFORATIONS of porous metal skin are so fine that light can barely penetrate.



BLOWER leading air from wing ducts is compressor stage of B-29 supercharger.

no intention of developing the equipment for personal aircraft.

▶**Layer Action**—In the past, many flap configurations have been developed which increase the lift and thus lower the minimum speed by increasing the effective wing camber. Leading edge slots and slats have been used to decrease the minimum speed by delaying separation of the wing boundary layer—a thin layer close to the surface, slowed by contact with the wing.

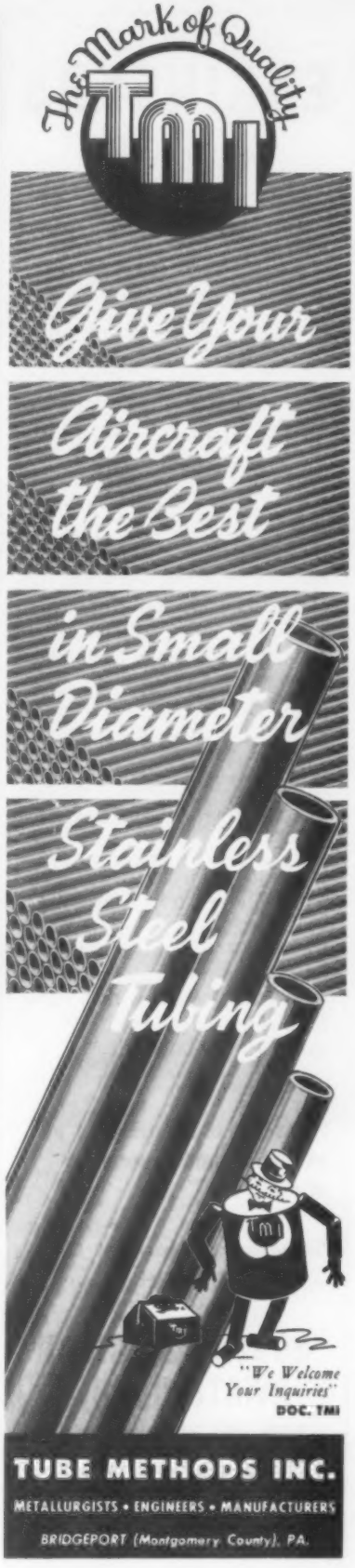
At low speeds, the layer thickens and tends to separate from the upper surface of the wing—reducing sharply the amount of lift and causing stall. Thus, if boundary layer separation can be delayed, the plane's minimum speed may be lowered, for greater safety.

Slots or slats delay the separation by diverting some of the high-pressure air beneath the leading edge into the low-pressure boundary layer region above the wing, to give more speed to the boundary layer.

Serving the same purpose as slots or slats, the suction method delays separation by taking off the boundary layer and blowing the air over the ailerons to increase control effectiveness or dumping it overboard through fuselage exits.

Theoretical and experimental work, says NACA's project engineer Paul A. Hunter, has indicated that boundary layer suction distributed over an area of the leading edge via a porous surface might produce equal lift increments more economically than suction slots in the same location.

▶**Critical Factors Out**—Formerly, most boundary layer experiments with suction have employed slots on the upper surface of the wing. But location of these suction slots is critical, varying



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with each wing design as well as with different angles of attack of the same wing. Slot design, too, is a critical factor —so critical, says NACA, that a poor design may do more harm than good.

The porous metal skin is seen offering a great advantage in eliminating these critical factors. Apparently, it can be used on any wing shape, and is efficient at any angle of attack, it is reported. Thus, the use of porous metal would eliminate the necessity of running a series of tunnel tests if suction slots were contemplated for various wings.

And because the porous metal affords a relatively smooth skin surface, it is considered better than slots from the drag angle. Chordwise distribution of the suction instead of concentration at one location, also aids in preventing separation, says NACA.

▶**Makeup**—Investigating the practical problems of the installation through the flight trials, NACA is checking to determine to what extent the pores are clogged by rain, dirt blowing around the airport, swarms of insects, etc. Also being studied are construction details of the skin and wing, and design factors of the blower and associated ducting.

The leading edge comprises a Monel metal filter cloth rolled and hammered to reduce porosity. This is backed by a layer of bronze screening and a thin sheet of perforated brass for stiffness. The holes are so small that light can barely penetrate this porous sheet.

The blower—a turbosupercharger compressor pushing air at 20 cu. ft./sec. —is driven at low speed by a 25-hp. engine through a 1:3 gear ratio.

Velocities and pressures are measured at various duct stations. And the exit ducts have dampers to close off for no-suction.

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NACA Reports

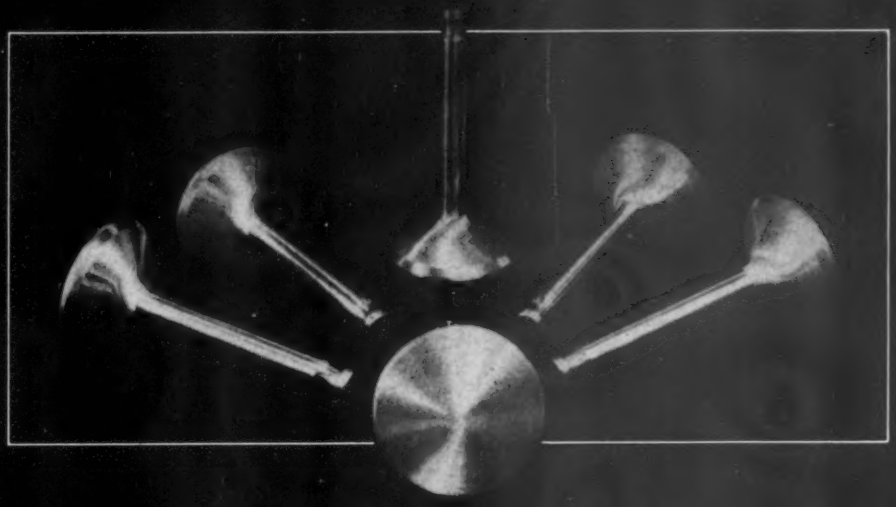
▶**A Survey of Methods of Determining Stability Parameters of an Airplane from Dynamic Flight Measurements (TN 2340)—by Harry Greenberg.**

This report considers various methods of reducing to stability parameter form an aircraft response to sinusoidal and transient disturbances. The simplified longitudinal motion of an idealized airplane is used as an example. The report shows that there are basic limitations in determining some of the stability derivatives, as compared with the transfer-function coefficients, which are certain combinations of stability derivatives directly related to the airplane response. Therefore, most of the report is concerned with determining transfer-function coefficients, rather than stability derivatives.

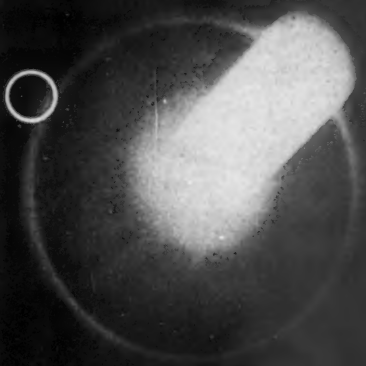
A method of least squares is applied to give the desired parameters, and also the ratio of parameter error to that of the basic data. Determining these parameters and the corresponding error ratios is a non-linear problem which can be solved by linearization, using a first approximation. Methods for obtaining a good first approximation, which also involve a least squares procedure, are explained and illustrated. The examples are confined to a simplified case of longtitudinal motion. However, the presented methods can be generally applied to other, more complicated types of motion.

▶**Effect of Vertical-Tail Area and Length on the Yawing Stability Characteristics of a Model Having a 45-Deg. Sweptback Wing (TN 2358)—by William Letko.**

Stability information is unavailable for many of the main components of airplanes designed to meet the demands of high-speed flight. Wing design changes have been extensively investigated to determine their effect on stability characteristics. But in order to provide information on the influence of other parts of the airplane, an investigation of a model with various interchangeable components is being conducted in the Langley Stability Tunnel. (Earlier reports in this series present the



When minimum specs hit tops . . .



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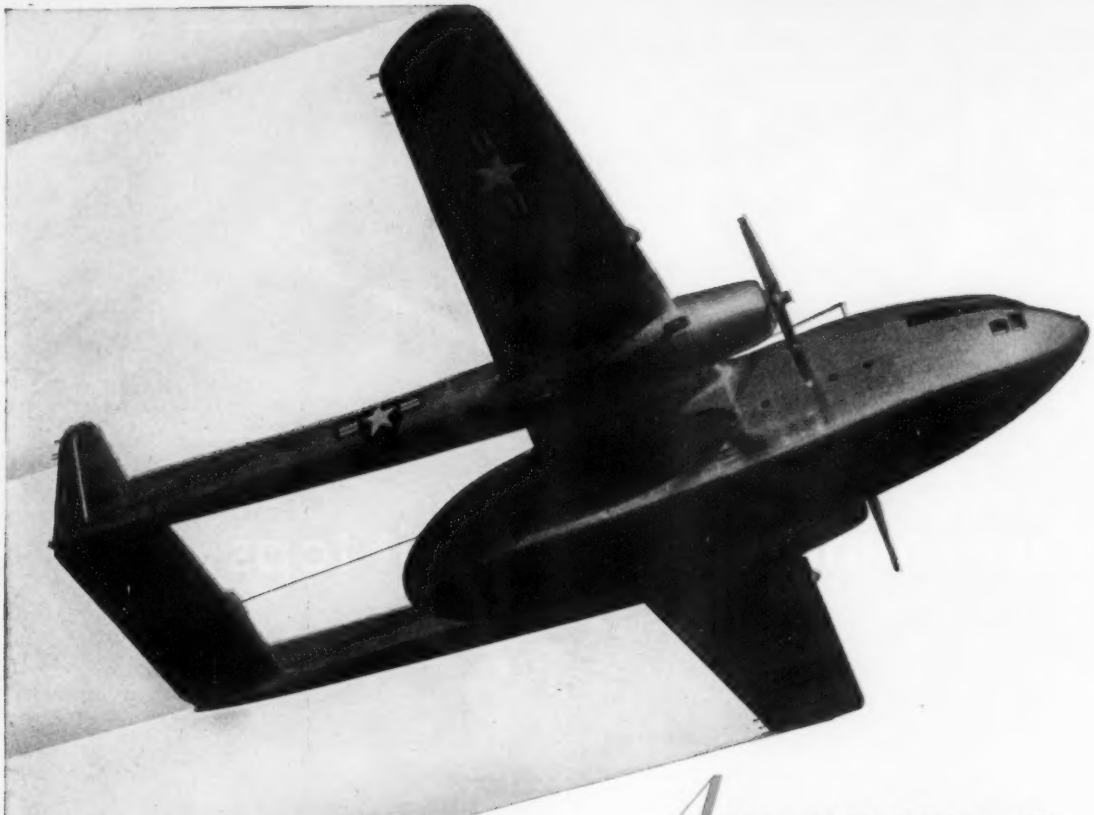

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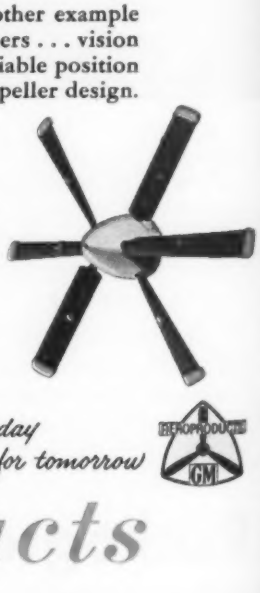

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results of investigations to determine the effect of tail area and tail length and the effect of location of a swept horizontal tail. Both these reports were concerned with the static lateral stability characteristics.)

A general research model was used, representative of typical aircraft configurations. Three circular-arc fuselages of circular cross sections were selected; these had the same maximum diameter, but were of different fineness ratios. Tail sizes were chosen to give ratios of tail areas to wing area, between 0.075 and 0.225. The model was equipped with a 45-deg. sweptback wing with aspect ratio of 4.

The results of the investigations indicated the following conclusions:

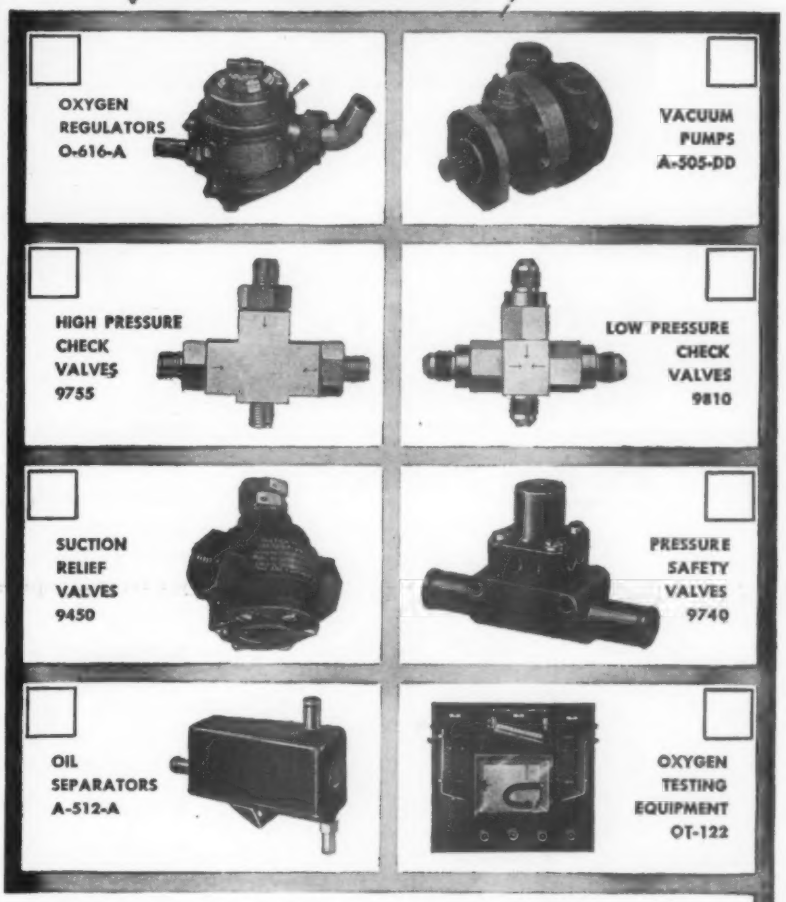
- Wing-fuselage interference effects were small over most of the angle of attack range.
- At moderate and high angles of attack, the fuselage and the wing produced rather large interference effects on vertical-tail effectiveness. But these effects tended to cancel each other and had little over-all effect on tail effectiveness.
- Fuselage alone had little effect on the effective aspect ratio of the vertical tail.
- Tail contributions to the yawing derivatives were estimated fairly accurately for most of the angle of attack range by available procedures.
- A full-span wing slat had very little effect on the tail effectiveness at 0 degree angle of attack.

▸Charts and Tables for Use in Calculations of Downwash of Wings of Arbitrary Plan Form (TN 2353)—by Franklin W. Diederich.

Longitudinal stability analyses and horizonal tail surface design depend on a knowledge of the downwash behind the wing of an aircraft. Available design charts give a convenient means of estimating downwash behind unswept wings. These charts cannot be applied to swept wings and to wings of more complicated planform, because: the assumed bound vortex is unswept; the assumed spanwise lift distributions are those of unswept wings.

It is not considered practical to prepare extensive charts to give downwash fields for arbitrary plan forms. This is because of the additional variables introduced by sweep and by complicated planforms. But when the spanwise lift distribution is known, the representation of the wing by a vortex pattern and calculation of the downwash field associated with that pattern (with certain simplifying assumptions), is a fairly straightforward but time consuming problem.

So what this paper does is to present a method, together with necessary charts and tables to facilitate such calculations. The tables and charts give



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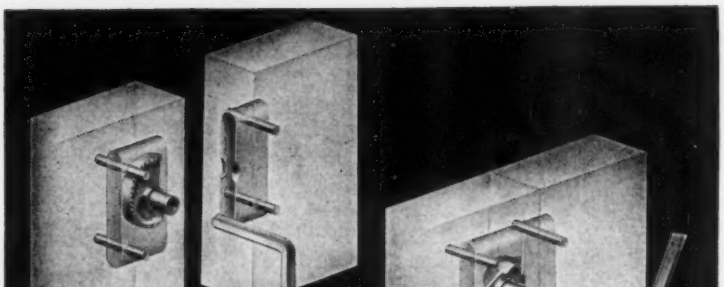
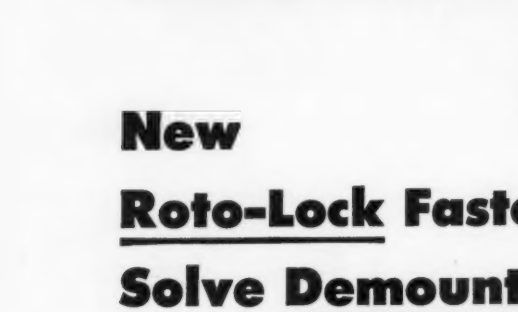


Serrated, tapered cam in male component engages lip of female. Panels are drawn tightly together when cam is turned by hex wrench, screwdriver, or any hand tool.

Lightweight air transport shipping containers, with Roto-Lock Fasteners, knock down quickly for easy return shipment.

PHOTO, COURTESY UNITED STATES PLYWOOD CORPORATION

New Roto-Lock Fasteners Solve Demountable Panel Problems



This portable shelter is made of honeycomb panels developed by the U. S. Plywood Corporation. All panels are attached with Simmons Roto-Lock Fasteners. Portable buildings are also being planned for alert hangars and maintenance hangars for fighter aircraft.

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the downwash field of an elemental rectangular, horseshoe vortex. Basis of the method is to distribute these vortices along the wing span in such a way that they approximate the lifting action of the wing, and then superimposing the downwash fields of the individual vortices.

The author notes that the method is probably inapplicable in many cases of present interest where there are such characteristics as high angle of attack, low aspect ratio, large angle of sweep, high taper, or a relatively large fuselage. These particular features result in uncertain spanwise lift distribution, partly separated flow, and rolled-up vortices. However, a few comparisons have been made between calculated and experimental results for cases in which the aspect ratio, leading-edge radius and angle of attack are reasonably favorable for such comparisons. Even for these cases, certain discrepancies remain unexplained; but the comparisons are rather satisfactory in general.

Several of the charts which would be difficult to read in page size are reproduced in expanded form in an envelope at the back of the report.

▶Water-Landing Investigation of a Model Having Heavy Beam Loadings and Zero Degree Angle of Dead Rise (TN 2330)—by A. Ethelda McArver.

This report covers one phase of an experimental program being conducted at the Langley impact basin. Over-all purpose of the program is to determine the landing-impact characteristics of hydrodynamic configurations having heavy beam loading.

Time histories of horizontal and vertical displacements, vertical velocity, vertical acceleration, and pitching moment were obtained. The experimentally determined quantities are converted to non-dimensional coefficients; the variations of these coefficients are plotted against flight-path angle at water contact.

▶Two-Dimensional Transonic Flow Past Airfoils (TN 2356)—by Yung-Huai Kuo.

This report is concerned with the problem of constructing solutions for transonic flows over symmetric airfoils. The aspect of the problem which is emphasized is the initial phase, the mapping of the incompressible flow. In the case of the symmetric Joukowski airfoil without circulation, mapping is relatively simple; but the coefficients in the power series are difficult to evaluate. Consequently, the problem requires simplification.

Instead of the exact incompressible flow past the airfoil, an approximate flow is used; this flow differs only slightly from the exact one when the airfoil thickness is small. After this

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approximation of the incompressible-flow functions, the numerical calculation of the corresponding compressible flow by the hodograph theory does not present any essential difficulty.

This work was done at the graduate school of Aeronautical Engineering of Cornell University under the sponsorship and with the financial assistance of the National Advisory Committee for Aeronautics.

▶On the Problem of Gas Flow Over an Infinite Cascade Using Chaplygin's Approximation (TM-1298)—by G. A. Bugaenko.

This report is a theoretical, mathematical approach to the problem of a steady flow of a compressible fluid past two-dimensional infinite cascades. Chaplygin's simplified pressure-density relation is used in the solution of the problem.

The report is a translation of a piece which originally appeared in a Russian technical journal in 1949.

▶On the Application of Mathieu Functions in the Theory of Subsonic Compressible Flow Past Oscillating Airfoils (TN 2363)—by Eric Reissner.

This report is a highly mathematical treatment of the problem of two-dimensional subsonic compressible flow past oscillating airfoils. Explicit solutions are found in terms of Mathieu functions. Results are applied to the calculation of 3-dimensional corrections for the 2-dimensional theory. The effect of the incorporation of 3-dimensional effects on the Mathieu function solution of the 2-dimensional problem is shown. The developments are formal and must be supplemented by an appreciable amount of numerical calculations before the theory can be applied to specific problems.

▶On Two-Dimensional Flow After a Curved Stationary Shock (With Special Reference to the Problem of Detached Shock Waves) (TN 2364)—by S. S. Shu.

The purpose of the present work is an attempt to treat analytically the 2-dimensional problem after the shock. The method assumes a given shock-wave shape, which automatically determines certain initial conditions on the flow variables. Expressions for the stream function in the subsonic region following shock are found by approximate analytic means. After the stream function is obtained, flow density is determined by Bernoulli's equation, which connects density with stream function derivatives. The final solution can then be determined from the velocity field thus obtained.

This work was conducted at MIT under the sponsorship and with the financial assistance of NACA. —DAA

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New or expanding firms in the aviation field with excellent technical prospects are often held back because of financial handicaps.

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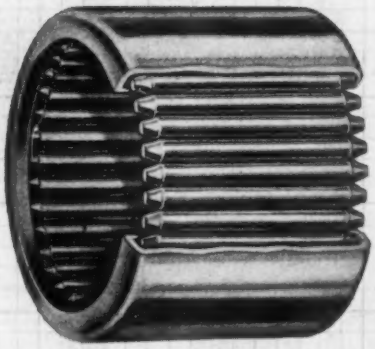
Test High-Speed Flight Minus Canopy

Northrop Aircraft has flown an uncanopied F-89 Scorpion at speeds over 500 mph. to investigate windstream effects on reaction of crewmen.

Five flights were made at Muroc's Edwards AFB to determine:

- Effects of canopy absence on the plane's handling characteristics.
- If pilot suffers sufficient discomfort to impair his control of the plane.
- Structural soundness of cockpit equip-

...with plenty to spare



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ment items to the limiting test speeds.
• Limiting speed at which radar observer, wearing presently available equipment, can eject himself.
• Effectiveness of the special AMC-type P1-A helmet and face visor in extending the tolerable speed range.

First tests—at speeds up to 400 mph. and under 6,000 ft.—were conducted with a dummy in the radar operator's station. Only damage was a tearing of the right shoulder on the dummy's suit.

For the second run, Northrop experimental flight department's asst. chief E. P. Hetzel took the radar station fitted with standard aviator goggles and a Lombard helmet. Plane speed was about 250 mph. at various altitudes. Air leakage around the goggles caused poor visibility and Hetzel had trouble interpreting interphone conversation as a result of turbulence noise, Northrop says.

The third flight took Hetzel to 6,000 ft., where speed was 335 mph. He wore the type P1-A helmet, with two-position visor for eye protection, which eliminated all obstructions to vision.

On the next run, the life-size dummy was in the radar operator's cockpit. The Scorpion's speed was stepped up to 580 mph. At 540 mph., helmet and oxygen mask were pulled off the dummy, and the left shoulder of the flight suit also came away.

On the final flight, which was made at 520 mph., passenger was Maj. John Stapp, USAF flight surgeon and aeromedical research scientist, active in the development of air crew survival equipment. Wearing a P1-A helmet, he suffered no injuries and maintained all faculties during the flight.

Lew Nelson, Northrop test pilot, handled the controls on all five flights. Although the plane was minus its canopy, its handling characteristics were not markedly affected, and Nelson didn't encounter any appreciable discomfort.

Cockpit equipment, reports Northrop, was found to be structurally sound to 575 mph.

And the tests, says the company, proved that the radar operator, using an AMC-furnished visor, could eject himself at speeds over 500 mph.

Boeing Adds to Plant

Boeing Airplane Co. is going ahead with the construction of an $800,000 jig-erection building at its Seattle Plant No. 2.

The new facility will figure in the production of the B-52A multi-jet heavy bomber and other programs.

It will be housed in a 200x300-ft. concrete and steel structure and will have two ceiling levels, 18 and 40 ft., the latter area being fitted with two 15-ton overhead cranes.

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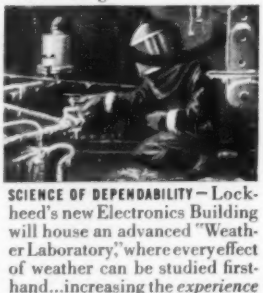
KOREAN BOOMERANG—Like Lockheed's famous Hudson Bomber ("Old Boomerang") of WW II, the F-80 *Shooting Star* has proved rugged in combat. Built to take terrific battle damage yet return to base, the F-80 did exactly that in Korea . . . another "Boomerang."



SCIENCE OF DEPENDABILITY—Lockheed's new Electronics Building will house an advanced "Weather Laboratory," where every effect of weather can be studied first-hand...increasing the *experience* behind Lockheed dependability.

Fly Constellations Via:

IN THE U.S.—Capital Airlines, Chicago & Southern Air Lines, Eastern Air Lines and Trans World Airlines.

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Lockheed

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Look to Lockheed for Leadership

Lockheed

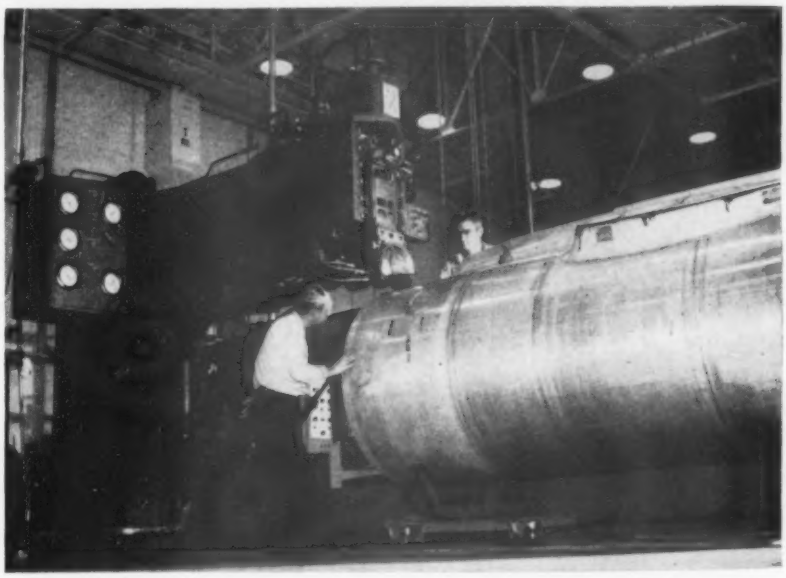
BEGINS WORK ON GIANT JET BOMBER

Production of an undisclosed number of giant B-47 jet bombers has begun at Lockheed's Marietta, Georgia, factory.

As the world's leading producer of jet aircraft and modern high-speed transports, Lockheed is especially qualified to build the Boeing-designed B-47's for the Air Force. Production floor space at Marietta, plus Lockheed's California factories, makes Lockheed as large today as the entire U.S. air-frame industry in 1940.

What's going on at Lockheed?
Lockheed has developed a high-speed camera with a speed range of from 1,000 to 3,000 frames a second. At 3,000 per second, a 100-foot roll of 16-mm film goes through the camera in 1¼ seconds. Purpose of the speed: to check results when fast-dropping die hits a blank piece of metal. Objective: development of stronger, new-type alloys for greater, faster aircraft ... Another current research project creates arctic flying conditions 20,000 feet above the California desert. On an actual F-94 All Weather Jet Fighter, a spray bar shoots a fine, foggy mist on the nose and wing, building up layers of ice. Plane's de-icing equipment is thus tested in actual flight.

Past and future at Lockheed...
One of Lockheed's earlier transports, a Model 10 Electra, is approaching its 25,000th hour of flying time, in continuous service since 1937 for South Coast Airways, Pty., Ltd., of New South Wales (Australia)... New Lockheed Super Constellations, in service by year's end, will be the largest, fastest, rangiest commercial transports in service. So well have earlier Constellations proved themselves around the world that more than 100 Super Constellations were ordered before the first production model flew... The new Lockheed-developed thin wing for the advanced F-94C—so thin it looks almost fragile—is strong enough to support two fully-loaded Super Constellations (150 tons dead weight)—one at each wing tip. This new plane, America's continental defender because of its electronic superiority, contains enough installed electrical power to supply a small community.



HUGE WELDER with 60-in throat easily handles giant external fuel tank.

New Tools for Speed Welding

Ryan installs giant resistance welding machines for handling large parts; employes develop sequence timer.

A new set of giants has been added to the growing store of aircraft industry shop "heavies." Ryan Aeronautical Co. has just bolstered its production line with several new resistance welding machines—reported to be the largest of their kind in the country—to boost its capacity to cope with the growing size of aircraft and engine components.

And to squeeze more work from its large battery of spotwelders, Ryan has adapted a more efficient sequence timing panel devised by two employes close to the production picture.

▶ **Big Boys**—One type of the new huge welders was built by Federal Machine and Welding Co. to Ryan's specs. It will handle such heavy gages as two sheets of ⅛-in. aluminum alloys, .156-in. austenitic corrosion-resistant steels, or .281-in. carbon steels. The machine's deep throat stretches 60 in.

The other type was fabricated by Thomson Electric Welder Co. It will take two sheets of aluminum alloys .102 in. thick. Throat depth is 48 in.

Both types can be used for spot, roll spot and seam welding by interchanging electrode tips and wheels. Tips are cooled internally by circulating water. Wheel electrodes can be "flood" cooled—desirable for welding steels.

▶ **Hugh Tank Job**—First job for the new equipment will be to speed production of mammoth external aluminum alloy fuel tanks—reported to be the largest known to have been fabricated for aircraft. These resistance-welded containers are protuberance-free, with gas-tight seams that eliminate the need for sealing compounds.

The new machines make the first spotweld at a reduced heat to avoid damaging the material as a result of heat buildup, after which normal heat is applied automatically.

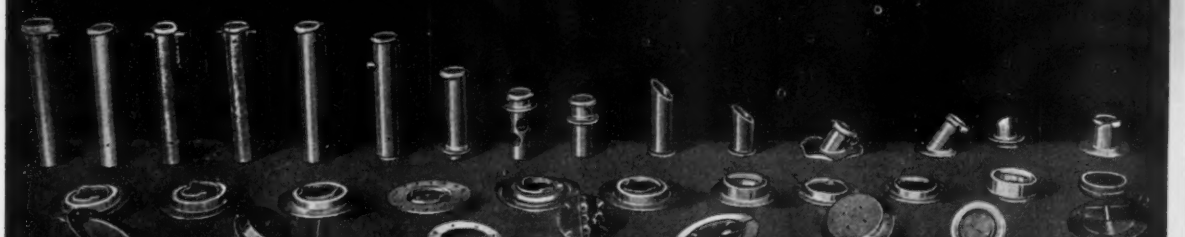
Weld size is controlled by contoured wheels. And the wheel electrode is continuously dressed to do away with the time involved in routing it to a lathe for turning. Upper electrodes swing out and away from the work for quick set-up change.

▶ **Special Control**—General Electric electronic controls convert 60-cycle, three-phase line power to several lower frequency, single phase requirements. The control panel provides fixed increments for obtaining increments of heat, enabling operators to get duplicate settings on succeeding runs.

Ryan is using these control facilities to select heat times by full cycle, alternate half-cycle, or plus or minus cycle firing, as required. Alternate half-cycle firing can be used to give exact

When it comes to filler units Experience points to

STEEL PRODUCTS ENGINEERING



Pioneers in filler unit design, testing and manufacture

Since the early days of aircraft manufacture we have been a leader in the design, testing and manufacture of filler units, caps and adapters. We've done it for hundreds of exacting Army-Navy, aircraft industry and Ordnance jobs—various sizes and shapes for fuel, alcohol, oil, water or what have you. Caps and adapters for dropable tanks and Ordnance equipment, too.

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RYAN'S sequence panel is simple in comparison with machine unit (background).

amounts of heat for welding aluminum alloys which require higher current but shorter heating times. With the plus or minus cycle firing it is possible to get undirectional spotwelding in which the nugget is formed off center—an advantage in joining sheets of varying thicknesses.

Power of the new machines is evidenced by the 105,000 amp. they will develop on short circuit across the electrodes. Electrodes' pressure runs to a maximum of 9,100 lb.

▸**New Sequence Timer**—Ryan, like other large operators of machine tools, ran into the production-cutting factor of "down" time. It uses a huge battery of welding machines of all types. It wasn't unusual for one of its many spotwelding machines to be tied up for as much as 48 hr. while the unit's masterminding electronic control—the sequence timing panel—was checked for trouble.

During an eight-hour day, one of these machines can pinpoint more than 30,000 spotwelds, so any appreciable down time bites deeply into production.

When trouble occurred, checking the intricate circuits of standard sequence panels was a tedious job. Ryan's troubleshooter Eddie Duke and electronics expert Bill Phillips looked at the timer from a maintenance man's viewpoint and came up with a simplified approach. They devised a panel that works so well that Ryan is installing it on all spotwelders for which it is adapted.

▸**Many Benefits**—Ryan says that the new installation is easier to service and maintain, more efficient and trouble-free than those available commercially.

It is built from a number of readily obtainable parts costing only a fraction

FOR MAXIMUM JET POWER

Stainless steel nozzle assemblies for jet aircraft engines. ABOVE: nozzle tip assembly. ABOVE, RIGHT: duplex nozzle assembly. TO RIGHT: dual flow nozzle assembly. All details of these units have been manufactured and assembled by Ex-Cell-O to the rigid specifications of the aircraft industry.

Ex-Cell-O Precision Parts

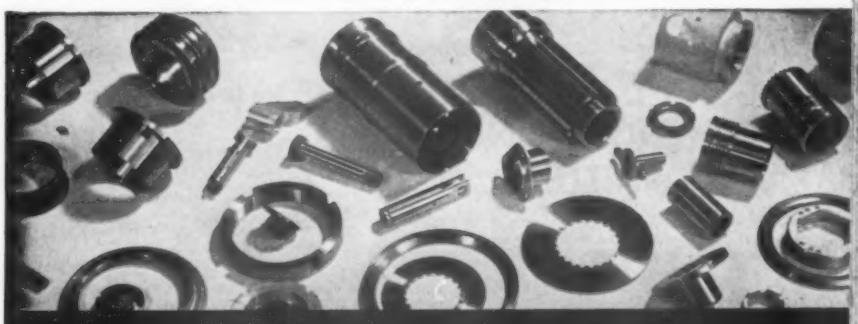
XLO
EX-CELL-O for PRECISION

Working in stainless steel to customers' rigid specifications, Ex-Cell-O is actively engaged in production of jet aircraft nozzle assemblies. This is but one of the latest developments in a long-standing program of service to the aviation industry. The result: engine, propeller, or fuselage of practically every plane produced in this country has parts made by Ex-Cell-O or finished on Ex-Cell-O precision machines. Such wide acceptance speaks well for Ex-Cell-O quality.

Ex-Cell-O has complete parts production facilities, including rough and finish machining, heat treating, and metallurgical control, all done directly under one responsible management. All these facilities are being utilized by the aircraft industry in its rapid progress in commercial and military air power.

Below: Some typical precision aircraft parts manufactured by Ex-Cell-O to customers' specifications.

51-7



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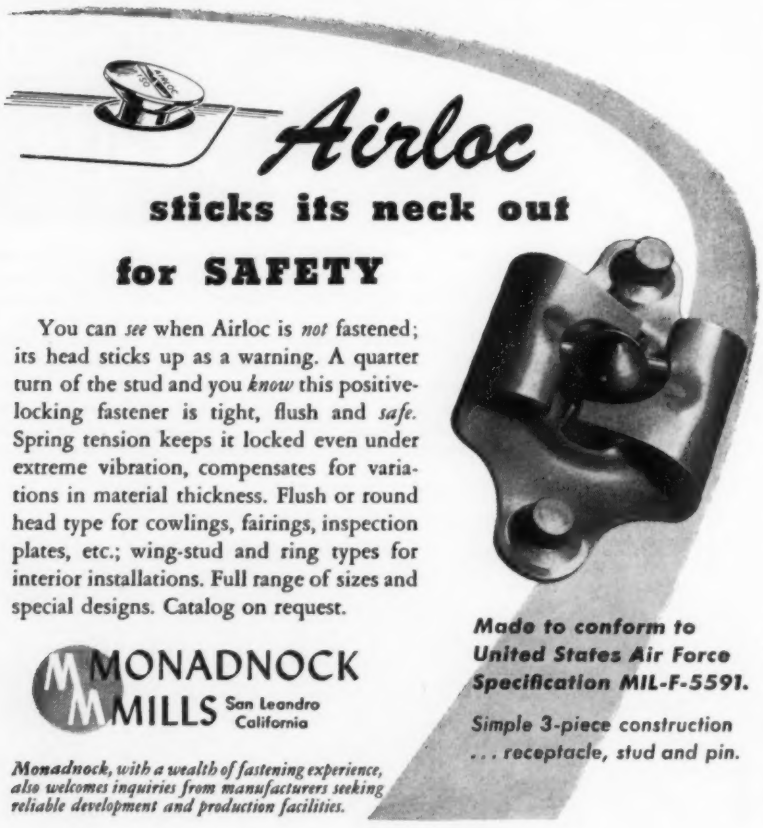

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Made to conform to United States Air Force Specification MIL-F-5591.

Simple 3-piece construction . . . receptacle, stud and pin.

of the price of panels that can be purchased. And loss of valuable spotwelding machine time resulting from sequence panel trouble has been cut to a minimum by use of the equipment, the company reports.

The unit uses midget-size, interchangeable relays which are installed in 11-pin, tube-type sockets. Although small, these relays actually have larger contacts than those used on standard relays. This permits them to carry a heavier flow of current and extends service life.

The timer can be used on any resistance spotwelder of the single phase or stored-energy type by simply installing or removing a jumper wire. This allows standardization of a uniform panel for most machines.

It isn't difficult for maintenance men to learn this one panel's circuits and this eliminates the need for familiarization with the different types of installations for the various machines.

▶ **Time Saved, Errors Out**—And a machine doesn't have to be taken out of production for more than a few minutes if the new panel isn't functioning properly. Maintenance removes the defective timer and installs a spare—easily done, because the unit is fitted with plug-in connection. This done, the faulty timer can be worked over in the maintenance shop, without cutting into machine time.

Another dividend is the elimination of imperfect spotwelds resulting from operator error. Ryan says that with standard panels it is possible for the operator to release the foot-switch before the welding current has been cut and bring the forging pressure to bear during part of the weld time. This excess pressure prevents the formation of the spotweld.

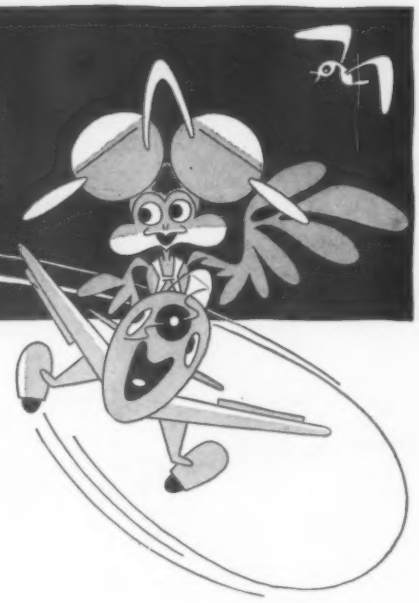
With the new panel, the operator can't do this because the circuits are so arranged that he can't alter the accurate, automatic behavior of the sequence timing after the cycle has started. Each relay locks itself in and cannot be released prematurely because of operator error.

Master Planner To Expedite Production

Convair is using a master planning section to analyze factory data at Fort Worth to keep management informed of the work load and the plant's capacity to turn it out.

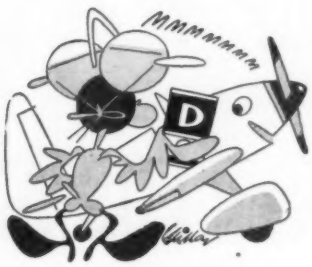
It is believed that this system will obviate the necessity for forming special committees whenever there is contemplated change in production schedules. Manager of the new section is V. C. Gillon, formerly production manager.

What's the right oil for *your* airplane engine?



You've heard so much about aircraft oils you probably want to know which one is best for *your own engine.* Good idea. You'll fly more safely, no matter what type of engine your plane has, if you use the *right* oil for your engine type. For example:

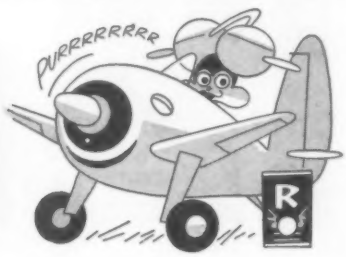
Horizontally opposed engines need Gulfpride Aviation Oil Series-D!



Here's the world's finest detergent-dispersant aviation oil. It's made *exclusively* for use in horizontally opposed engines. Because it is put through Gulf's exclusive Alchlor Process to remove extra amounts of carbon-and-sludge formers, Gulfpride Aviation Oil, Series-D, prevents ring and valve sticking . . . maintains a cleaner, better operating condition longer.

Actually, users have increased periods between engine overhauls as much as 100% with this great oil!

For radial engines or where a detergent oil is not desired, use Gulf Aircraft Engine Oil Series-R!



Assures superior performance in radial engines. Especially recommended for maximum operating periods between overhauls, it may also be used in horizontally opposed engines when operating conditions do not require a detergent oil.

A fine-quality, non-detergent, straight mineral oil, Gulf Aircraft Engine Oil, Series-R, is highly effective in retarding sludge formation. Maintains its body at high operating temperatures, too.

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LV. 10:00 a.m. EST	LV. 10:00 p.m. EST
LV. 12:00 Noon EST	LV. 12:20 a.m. EST

TO NEW YORK

LV. 9:25 a.m. PST	LV. 7:00 p.m. PST
LV. 9:30 a.m. PST	LV. 10:45 p.m. PST
LV. 9:50 a.m. PST	LV. 11:25 p.m. PST

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AMERICA'S LEADING AIRLINE

EXPANDING INDUSTRY

Aerol Co., Inc., Lockheed Aircraft subsidiary, has moved to larger quarters (14,400 sq. ft.) at 2424 San Fernando Rd., Los Angeles. . . .

Airborne Instruments Laboratory, Mineola, N. Y., has broken ground for a new engineering and production division building, adding 50,000 sq. ft. to the firm's facilities at a cost of about half-million dollars. . . .

Aircraft Engineering & Maintenance Co., Oakland, Calif., has received a $6-million USAF contract for overhaul and maintenance of C-54s, and has increased its overhaul facilities from 120,000 sq. ft. to more than 165,000 sq. ft.

Aviation Engineering Corp. has moved its executive, general and engineering offices into a new building adjacent to the plant so as to provide more production space. Firm is located in Woodside, L. I., N. Y. . . .

Bausch & Lomb Optical Co., Rochester, N. Y., has formed a special defense contract department to handle its increase in military orders and is seeking about 500 more workers.

Borg-Warner Corp., Chicago, plans a 104,000 sq. ft., $3-million plant in Wooster, Ohio, for output of jet engine electrically driven hydraulic and fuel pumps. . . .

Broward County Airport, Fort Lauderdale, Fla., is feeling defense expansion moves of tenants: Servomechanisms, Inc., L. I., N. Y. has leased 18,000 sq. ft. of plant space to produce airborne electronic equipment; Consolidated Productions, Inc., formerly of Detroit, is turning out electronic equipment in a 16,020 sq. ft. building at the field and Lauderdale Turbine Products, division of Detroit Broach Co., is making jet engine components. . . .

Chicago Metal Hose Corp., Maywood, Ill., plans construction of a 120,000-sq. ft. factory for fabricating aircraft components and assemblies. . . .

Chrysler Corp. has broken ground on 1.6-million sq. ft. production and test facility where P&W J-48 turbojets will be built for the Navy, with operation scheduled for early 1953. Also, a new Chrysler plant in Indianapolis is being completed to turn out parts for the J-48 and automotive parts for civilian needs. . . .

Collins Radio Co., Cedar Rapids, Iowa, has established a procurement division to consolidate activities of the manufacturing division's purchasing department. . . .

Gibson Refrigerator Co., Greenville, Mich., has received a subcontract from Chance Vought Aircraft to build wing flaps for Corsair fighters. . . .

Grand Central Aircraft Corp. is expanding facilities at Tucson Municipal Airport following granting of a $6-million Federal Reserve Bank loan. The firm is busy demothballing Boeing B-29s. . . .

Gyrodyne Co. of America is consolidating all engineering, manufacturing and administrative activities at a newly acquired plant at Flowerfield, L. I., N. Y. The plant has 30,000 sq. ft. of manufacturing space and a railroad siding. . . .

Hudson Motor Car Co., Detroit, has concluded subcontracting arrangements with Glenn L. Martin to engineer, tool and build B-57 Canberra rear fuselage and tail sections. . . .

Interstate Engineering Corp., El Segundo, Calif., has received a contract for over $1 million from Douglas Aircraft to make AD-4 Skyraider fuselage subassemblies. Interstate will hire 125 new employes to handle the increased business. . . .

Lockheed Aircraft Service, Inc., has built a 9,000-sq. ft. warehouse at its Burbank maintenance and overhaul base. . . .

Lovequist Engineering Co., Los Angeles, has doubled its production capacity for machining precision components for aircraft by moving to 8737 Melrose Ave.

J. A. Maurer, Inc., Long Island City, N. Y., has received a contract for approximately a half-million dollars from USAF for 16-mm Type O-22 cameras for recording radar images. . . .

North American Aviation has started renovation of approximately 130,000 sq. ft. of covered floor space at Fresno Air Terminal it has leased from the city for manufacturing operations. . . .

Pacific Airmotive Corp., Burbank, has gotten a $3.5-million USAF contract to overhaul an undisclosed number of four-engined transport planes, increasing the firm's backlog to over $11 million. . . .

Pratt & Whitney Aircraft has leased 70,000 sq. ft. of floor space in the Manufacturer's Foundry Co. building

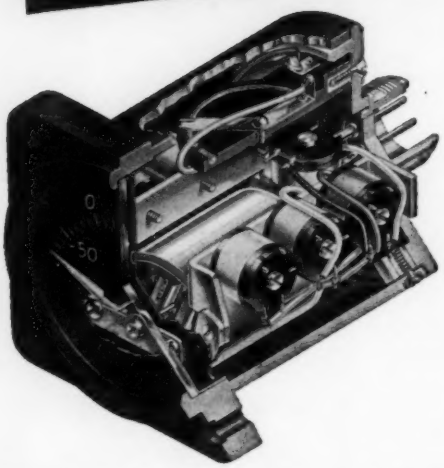
DARNELL CASTERS

Darnell Dependability assures savings, service, safety, speed. A caster or wheel for every use.

You are sure to find the exact caster or wheel for your individual requirements in the Darnell line.

DARNELL CORP. LTD.
LONG BEACH 4, CALIFORNIA
60 WALKER ST., NEW YORK 13, N Y
36 N CLINTON, CHICAGO 6, ILL

How EDISON Indicators Save 35 Pounds



EDISON electrical resistance temperature indicators were recently specified for cylinder head indication on a new type of four-engine transport. In this installation, two dual indicators and eight bulbs were used . . . at a weight saving of *35 pounds* under the thermocouple system formerly employed.

Weight economy is only one of the many features associated exclusively with EDISON instruments. Of special interest to maintenance engineers is the ability of EDISON indicators to adapt themselves to *any* temperature measurement application. The EDISON ratiometer movement is standard for all indicators whether used for cylinder head, oil, air, heating duct, etc. This standardization permits the temperature range in any given indicator to be changed merely by substituting a new dial and a few low-cost resistors.

It will pay you to investigate this proven way to save weight and cut maintenance costs. For complete information on indicators, send for our new Bulletin #3023. And for matching resistance bulbs, ask for Bulletin #3016.

Thomas A Edison
INCORPORATED

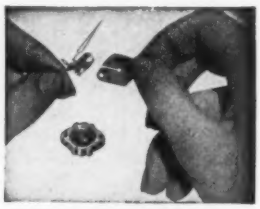
Instrument Division
52 Lakeside Avenue, West Orange, N. J.

•

OTHER INSTRUMENT DIVISION PRODUCTS
Fire Detection Systems • Engine Gages
Temperature Indicating & Alarm Systems
Time Delay Relays • Sealed Thermostats

Only EDISON Temperature Indicators have all these features

READABILITY WHERE IT COUNTS
Scale is expanded at center of range where operating temperatures are located.



RUGGED, TROUBLE-FREE CONSTRUCTION
Rotor is just a magnet on a steel shaft — No delicate moving coil.

EASE OF OVERHAUL
No special tools—No delicate hairsprings — Jewels easily replaced.

EASE OF CALIBRATION
Merely move the contact on a rheostat—No coil calibration.

YOU CAN ALWAYS RELY ON EDISON

at Waterbury, Conn. for use as a receiving center and transfer point for new machine tools it is getting for its three plants. . . .

Rohr Aircraft Corp., Chula Vista, Calif., has gotten orders for an undisclosed number of engine power-packages and aft nacelles for the Chase C-123 to be built by Kaiser-Frazer at Willow Run. This and other recent contracts brings Rohr backlog to over $92 million. . . .

Solar Aircraft Co. has received an $8-million order from Packard Motor Car Co. to make J-47 turbojet engine aft frames, exhaust cones, turbine casings, transition liners, and inner and outer combustion chamber liners. Bulk of the work will be done at Solar's new 300,000 sq. ft. Wakonda plant in Des Moines. Firm's current backlog is about $78 million. . . .

Sundstrand Machine Tool Co. has begun building a $700,000 addition, of 85,000 sq. ft. floor space, providing additional production space for its hydraulic division. Also, a further 5,000 sq. ft. expansion is being made in the company's machine tool division.

USAF CONTRACTS

Following is a list of recent USAF contracts announced by Air Materiel Command.

Packard Motor Car Co., Detroit, facilities for production of J-47 engines and components, over $250,000.

Pierce Governor Co., Inc., Anderson, Ind., facilities for production of J-47 engine components, over $250,000.

Pioneer Parachute Co., Inc., Manchester, Conn., parachutes & aerial delivery kits, parts, Cl. 20 900 & 30, $125,721.

Products Technicians, Inc., Rochester, photographic scales, Cl. AF 10B, 5,000 ea., $99,000.

Remler Co., Ltd., San Francisco, radio receivers R-122-ARN-12, Cl. 16A, over $250,000.

Republic Aviation Corp., Farmingdale, L. I., machinery and equipment, over $250,000.

Ryan Aeronautical Co., San Diego, machinery & equipment, over $250,000.

Schuttig & Co., Inc., Washington, D. C., radio receiver R-122/ARN-12, Cl. 16A, over $250,000.

Servel Inc., Evansville, Ind., industrial facilities, over $250,000.

Sikorsky Aircraft div., United Aircraft Corp., Bridgeport, Conn., helicopter H-19A, Cl. 01A, 1 ea., $245,510.

Singer Mfg. Co., N. Y., facilities for production of bomb release computers and polar converters, over $250,000.

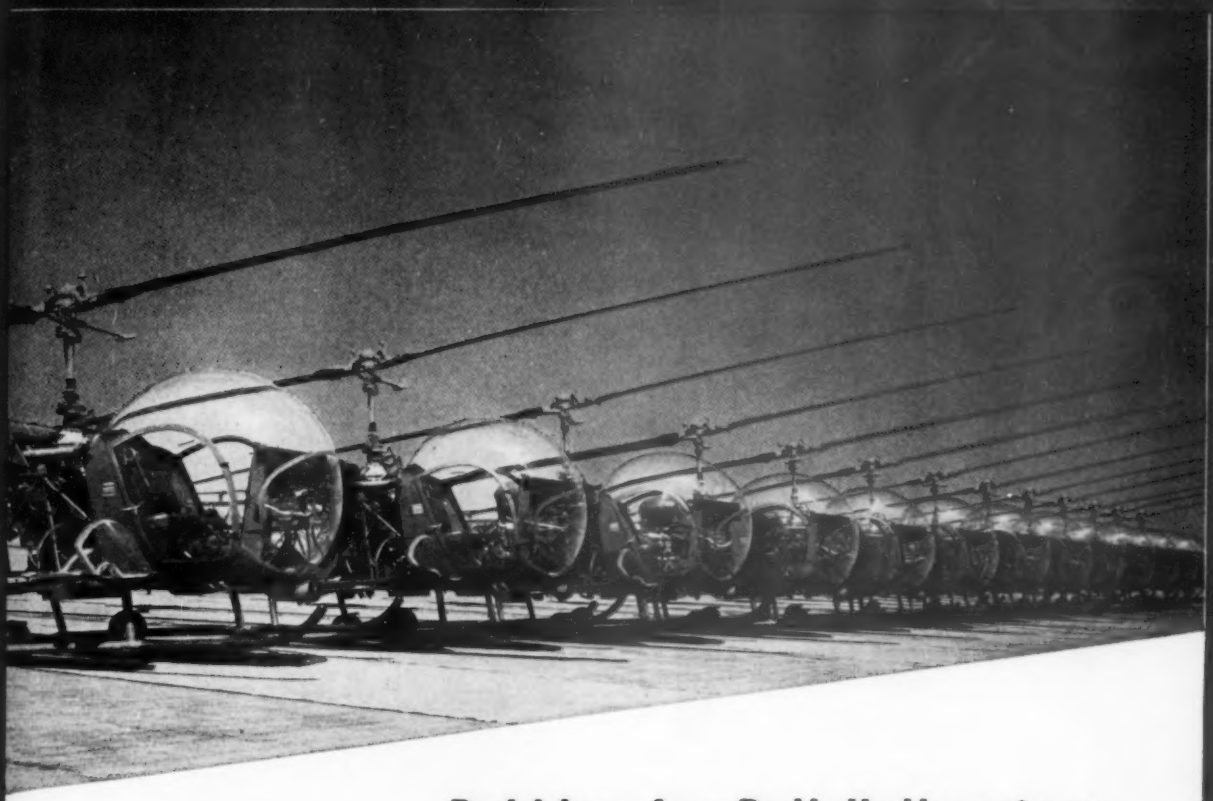
Solar Aircraft Co., San Diego, facilities for production of J-47 sub-assemblies, over $250,000.

Southern Airways School, Birmingham, operation of Bainbridge Field, Bainbridge, Ga., for conducting basic flying training, over $250,000.

Standard Oil Development Co., New York, testers as synthetic lubricants, $54,250.

Standard Steel Works, Kansas City, Mo., trailer, fuel servicing, for refueling small aircraft, Cl. 19B, 43 ea., $139,253.

Tokheim Oil Tank & Pump Co., Ft.



Bubbles for Bell Helicopters
.... from Single Sheets of PLEXIGLAS

To give helicopter pilots all-round visibility, Bell Aircraft Corporation blows big bubbles from single sheets of PLEXIGLAS. Each of the rigid, transparent enclosures on a Bell H-13D has a hundred and twenty-five square feet of surface area—four times the area of the flat acrylic plastic sheet from which it is formed.

Such enclosures demonstrate the clarity and formability of PLEXIGLAS. Add to these visible advantages the *hidden* properties of this acrylic plastic—strength, light weight, dimensional stability, resistance to weather—and you have the reasons PLEXIGLAS is the *standard material* for transparent parts . . . throughout the aviation industry.

Backed by years of experience in working with plane manufacturers, our laboratories and service departments are always ready to assist you in the aviation applications of PLEXIGLAS. If you do not have a copy of our new Handbook For Aircraft Engineers—write for one. It will help you make best use of the material in the design and installation of aircraft enclosures.

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada*

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

HIGH-STRENGTH, CLOSE-TOLERANCE FASTENERS for the AVIATION INDUSTRY

UNBRAKO® SOCKET SCREW PRODUCTS

STANDARD "SIX-DIGIT" ENGINE BOLTS

all listed diameters—hex and internal wrenching types; AN specifications. Information on request. Address Dept. 678.

NAS INTERNAL WRENCHING AIRCRAFT BOLTS

latest NAS specs; threads fully formed by rolling after heat treatment; full range of sizes. Dept. 678.

NAS SHEAR BOLTS

close tolerance, high strength, flush-head type. Dept. 678.

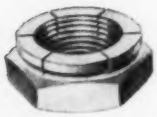
NAS INTERNAL WRENCHING LOCK-NUTS

superior safety nuts. Sizes from ¼" to 1½". Dept. 678.

Several decades' experience in the manufacture of fasteners for the most critical applications is your assurance of complete reliability in every SPS Aircraft Product.

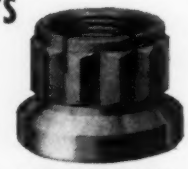
The finest equipment, workmanship and "know-how" are lavished on these vital aircraft parts. This has resulted in widespread acceptance and approval by government and civilian agencies alike.

FLEXLOC® SELF-LOCKING NUTS



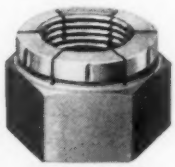
"FLEXLOC" THIN NUTS

less than regular height, yet conforms to accepted standards, since every thread, including locking threads, carries its share of load. Has all "regular" FLEXLOC features; saves height and weight; sizes #10 to 1". Dept. 51.



"FLEXLOC" EXTERNAL WRENCHING NUTS

incorporate famous FLEXLOC self-locking principle and one-piece, all metal construction. Latest NAS specs; sizes from ¼" to 1½" NF Thread Series; approved for temperatures to 550° F. Send for samples. Dept. 51.



"FLEXLOC" SELF LOCKING NUTS (REGULAR)

serve as both stop and locknuts. One-piece construction—resilient segments lock positively with uniform torque. Aircraft approval of sizes from #4 to 1" inclusive in steel, brass, aluminum. Since regular steel FLEXLOCS are approved for temperatures to 550° F., you need stock only one type locknut for this temperature range. Dept. 51.

For further information on products shown in this advertisement please address departments listed. Inquiries on other aircraft parts should be addressed to Department 678.

SPS STANDARD PRESSED STEEL CO.
JENKINTOWN 3, PENNSYLVANIA

Wayne, Ind., type D-16 pumps assemblies, model A-4B pump, 275 ea., assembly skid mounted using the above pump, 303 ea., $104,514.

U. S. Burke Machine Tool Co., Cincinnati, milling machine, bench type, Cl. 17A, 30 ea., $29,700.

U. S. Dept. of Agriculture, Madison, Wisc., development and testing services, $100,000.

Van Norman Co., Springfield, Mass., milling machines, Cl. 17A, over $250,000.

Willys-Overland Motors, Inc., Anderon, Ind., machinery & equipment to be used in production of J-47 engine components, over $250,000.

Wolverine Diesel Power Co., Detroit, plant, electric portable type B 6 B spare parts & data, Cl. 19F, over $250,000.

Wright-Aeronautical Corp., Wood-Ridge, N. J., spare parts for R-3350 aircraft engines, Cl. 02D, over $250,000.

Yates-American Machine Co., Beloit, Wisc., boree, wood, Cl. 17A, 50 ea., $58,950.

Aluminum Co. of America, Pittsburgh, facilities for production of extruded aluminum structural members for aircraft and components, over $250,000.

Aro Equipment Corp., Bryan, O., repair and modification of oxygen regulators, Cl. 03K, 4,970 ea., $175,043.

Baldwin Co., Cincinnati, engineering and consulting services, $57,180.

Bell Aircraft Corp., Buffalo, industrial facilities for production of guided missiles, over $250,000; bomb tails, Cl. 09E, over $250,000; industrial facilities, over $250,000.

Bendix Aviation Corp., Bendix Products div., South Bend, Ind., wheel and brake assemblies, Cl. 03B, 449 ea., $74,730.

Bill Jack Scientific Instrument Co., Solana Beach, Calif., industrial facilities for production of vertical gyro indicators, $100,000.

Boeing Airplane Co., Wichita, facilities for production of aircraft, over $250,000.

Boeing Airplane Co., Seattle, development of gas turbine, $60,000; miscellaneous spare parts, Cl. 01F, over $250,000.

Clayton Mfg. Co., El Monte, Calif., cleaner, vapor pressure, Cl. 17A, 3 ea., $50,592.

Delco Products div., General Motors Corp., Dayton, facilities, over $250,000.

Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, N. J., generator, Cl. 03C, over $250,000; indicator, torque pressure, Cl. 05D, 229 ea., $54,977.

Fairchild Engine & Aircraft Corp., Chicago, facilities for production of aircraft, over $250,000.

Fairchild Engine & Airplane Co., Valley Stream, N. Y., facilities for production of J-47 components, over $250,000.

General Electric Co., Bridgeport, Conn., control cable for main substation, 1 job, $27,271.

General Electric Co., Lockland, O., facilities for production of engines, over $250,000.

General Electric Co., West Lynn, Mass., acquisition and installation of a fuel storage & transfer system, over $250,000.

General Motors Corp., Buick Motor div., Flint, Mich., machinery and equipment, over $250,000.

General Motors Corp., Rochester, machinery and equipment, over $250,000.

General Services Administration, Kansas City, Mo., office furniture, equipment, $100,000.

Goodyear Tire & Rubber Co., Akron, wheel and brake assemblies, $26,941.

Haller, Raymond & Brown, Inc., St. College, Pa., research services, $25,000.

Hotpoint, Inc., Chicago, turbosuperchargers, Cl. 03E, over $250,000.

Hydro-Aire, Inc., Burbank, facilities for fittings and airplane components, over $250,000.

International Harvester Co., Chicago, facilities for production of various aircraft wheels and brakes, over $250,000.

Jack & Heintz Prec. Industries, Cleveland, starters, Cl. 03C, 509 ea., $95,700; generators, Cl. 03C, over $250,000; industrial facilities for production of electrical equipment, over $250,000.

Kooken, L. P., Co., Carlisle, Pa., architect, engineering services, $61,282.

Landers, Frary & Clark, New Britain, industrial facilities, $75,000.

RESEARCH
DEVELOPMENT

brings even the stars within reach . . .

Tonight, if the weather is clear, a man may chart the course of a star 6,000,000,000,000,000,000,000 miles from the earth, through the giant telescope at Mt. Palomar . . . a far cry from the crude 35-power glass through which Galileo first studied the heavens, centuries ago. In much the same way, important progress in every field of human endeavor, has always depended upon *research-development.* And through *research-development,* Eclipse-Pioneer has consistently kept pace with the brief, meteoric history of aviation . . . has frequently actually anticipated the needs of the industry. Thus, many of the instruments and accessories now under development at Eclipse-Pioneer are planned for use on aircraft whose performance will far exceed that of even the latest of today's planes. Continuing this policy, Eclipse-Pioneer is also at work on the *research-development* of components for guided missiles. All of this is important to you . . . for when you specify Eclipse-Pioneer instruments and accessories for your planes, you can be certain that they are the first word in quality and the last word in design.

ECLIPSE-PIONEER DIVISION OF Bendix AVIATION CORPORATION

TETERBORO, NEW JERSEY

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

PREPAREDNESS PRODUCTION

Enlists

AMPHENOL

Every element of national preparedness — from the smallest rivet to the finished ship, plane or piece of equipment — requires the best design, materials and workmanship. For if the decisions of these turbulent historic moments must finally be made in the field rather than in the halls of the U.N., the material of preparedness must work and work well! Amphenol RF Cables, RF Connectors and A-N Connectors have long been recognized as the quality electronic components and therefore preparedness production enlists Amphenol!

NOW AVAILABLE —

Catalog 82 — A General Catalog of Amphenol Components — will be sent upon receipt of a request on company or government agency letterhead.

AMERICAN PHENOLIC CORPORATION

Libbey-Owens-Ford Glass Co., Toledo, glass items for B-29 and B-50 aircraft, $33,682.

LiHon Industries, San Carlos, research and development of magnetron, $80,210.

Lockheed Aircraft Corp., Burbank, Calif., machinery and equipment and building supplies, over $250,000.

Lockheed Aircraft Corp., Palmdale, Calif., facilities for production of aircraft, over $250,000.

Loewy Construction Co., Inc., New York, installation of additional pressure station, over $250,000.

Lowther, Harry A. Co., Inc., Shelbyville, Ind., towing vehicles, Cl. 19B, over $250,000.

Mechanic Universal Joint div., Borg-Warner Corp., Rockford, Ill., universal joints for aircraft, 5,000 ea., $46,800.

Modern-Silver Linen Supply Co., Inc., New York, linen supply services for Mitchell AF base, over $250,000.

North American Aviation Inc., Los Angeles, assemblies and subassemblies, Cl. 01M, over $250,000.

Petro-Chem Development Co., Inc., New York, two air heaters, 1 job, $169,807.

Rauland-Borg Corp., Chicago, amplifier single channel, Cl. 05D, 1,274 ea., $83,455.

Reaction Motors Inc., Rockaway, N. J., experimental tests, $50,905.

Regents of the University of Michigan, Ann Arbor, study of fuel characteristics, $33,000.

Ronan & Kunzl, Marshall, Mich., liquid oxygen storage & transfer tanks, Cl. 19A, 88 ea., $193,000.

Serv-Air Aviation Corp., Raleigh, N. C., operation for Kinston Air Field, Kinston, N. C., for basic pilot training, over $250,000.

Stanford Research Institute, Stanford, Calif., study of production leadtime and USAF procurement, $36,915.

Steel Products Engineering Co., Springfield, O., facilities for production of aircraft components, $235,000.

Sundstrand Machine Tool Co., Rockford, Ill., constant speed drives, Cl. 03I, over $250,000.

Taylor, Forge & Pipe Works, Chicago, facilities for production of aircraft forgings, over $250,000.

Thompson Products, Inc., Cleveland, facilities for production of engine components, over $250,000; facilities for engine components, over $250,000; facilities for engine components, over $250,000.

U. S. Gauge div., American Machine & Metals, Inc., Sellersville, Pa., gages, manifold pressure, Cl. 05D, 1,975 ea., $69,615; transmitters, Cl. 05D, over $250,000; gages, hydraulic pressure, Cl. 05G, 4,705 ea., $39,462; transmitters, Cl. 05D, over $250,000.

Varo Mfg. Co., Garland, Tex., converters, Cl. 03C, 2,590 ea., $79,989.

Waltham Watch Co., Waltham, Mass., indicator, vertical gyro, over $250,000.

Western Electric Co., New York, facilities for production of radar system, over $250,000.

Westinghouse Electric Corp., Dayton, components of automatic pilot, Cl. 05F, over $250,000.

Whirlpool Corp., St. Joseph, Mich., facilities for production of aircraft components, $179,000.

Wright Aeronautical, Curtiss-Wright Corp., Woodridge, N. J., facilities for production of engines, over $250,000.

Wyman-Gordon Co., Worcester, Mass., facilities for production of aircraft forgings, over $250,000.

Aircraft Engineering & Maintenance Co., Oakland, Calif., C-54 maintenance inspection, over $250,000.

American Electroneering Corp., Los Angeles, signal generator, Cl. 16K, 19 ea., $29,298.

Anderson Air Activities, Milwaukee, operation of Malden Field, Malden, Mo., for conducting basic pilot training, over $250,000.

Boeing Airplane Co., Seattle, services and assistance in furnishing drawings, data and information to Douglas & Lockheed, over $250,000; machinery and equipment, over $250,000.

Champion Forge Co., Cleveland, facilities for production of aircraft forgings, over $250,000.

Let's go...let's get that SCRAP in!

All your SCRAP is urgently needed, NOW

THE scrap shortage is serious. *Your* scrap—every pound of iron and steel scrap you can locate in your plant or factory—is vitally needed and needed right away. For unless you do everything possible to get this scrap on its way to the mills, steel production is bound to slow up. That can't be allowed to happen. But without your help it surely will.

It takes at least one-half ton of scrap to make one ton of steel. With the mills turning out more than 2 million tons of steel per week, over 1400 carloads of industrial scrap are needed *every day*. And industry, somehow, must provide it.

What you can do to meet this emergency

First, organize a permanent Scrap Salvage Committee and make the "drive-for-scrap" part of your daily operations. Search out every possible source of scrap. Turn your old and worn-out equipment, tools and machinery over to your scrap dealer, at once. Dig out your discarded dies, rusted-out tanks and boilers, your old rails and other miscellaneous junk, and start them back to the mills through your scrap dealer. Encourage every employee to report every retired or obsolete machine that now stands idle—see that it is turned in for scrap.

By getting this "dormant" scrap off your premises and into the furnaces you'll be helping not only yourself but America as well. *More* scrap turned in, means *more* steel turned out—it's as simple as that. So let's get going.

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

This page would ordinarily be used to tell you about

SHELBY SEAMLESS AIRCRAFT TUBING

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
(Tubing Specialties Division)
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS TRADE MARK

1-1328A

UNITED STATES STEEL

Fuel is pumped through "flying boom" into Stratojet from Stratofreighter tanker plane at high altitude.

Connected for "Long Distance"

"IMPOSSIBLE" a few months ago — routine today.

That's the story of how Boeing, working closely with the U. S. Air Force, has perfected a mid-air refueling technique capable of serving bombers and fighters — greatly extending their range and effectiveness.

Already, mid-air refueling equipment is standard on the B-50 Superfortress and the 600-mile-an-hour B-47 Stratojet bomber. Successful tests have also been made with Uncle Sam's high-speed jet fighters.

Two Boeing developments make possible fast, safe, mid-air refueling. One is the ingenious "flying boom" — a telescoping pipe from the tanker plane through which fuel is pumped into the receiver ship.

The second development is the KC-97A Stratofreighter tanker which can rendezvous at high altitudes with the B-47 Stratojet — or jet fighters — and transfer large quantities of fuel very quickly.

Advances like these explain why Boeing airplanes continue to grow, not only in speed and striking power but also in range, long after they leave the production line. They help keep America out in front in the world parade of airpower.

For the Air Force, Boeing builds the **B-47 Stratojets, B-50 Superfortresses** and **C-97 Stratofreighters;** and for the world's leading airlines Boeing has built fleets of the new twin-deck Stratocruisers.

BOEING

C&S Maintenance Plan

Specialist for Each Plane Type

Making one man responsible for Connies and one for DC-3 details has paid off in faster, smoother maintenance.

By George L. Christian

Memphis—Smooth relationship between flight crews and maintenance mechanics is being fostered by Chicago and Southern Air Lines. To attain this goal, the company has appointed one man to be responsible for every detail of maintenance of one type of aircraft.

Most airlines know only too well the familiar pilot's cry: "I've squawked that item on three consecutive flights and nobody does anything about it."

To wipe such comments off the pilots' logs, C&S chose two men, one thoroughly familiar with the Constellation, the other with DC-3, made them technical foremen and gave them the job of following every malfunction, that occurred on the respective planes.

R. Herwig, chosen for Connies, was thoroughly schooled at Lockheed, Wright, and Hamilton Standard before assuming his duties. H. Halyard, DC-3 technical foreman, was already well checked out on the older ship.

▶**How it Works**—Each man is advised by teletype of any mechanical failure that occurs to a plane under his jurisdiction the moment it happens at any line station except for those in the Carribean area where teletype communication with the Memphis headquarters is being established.

As soon as possible, Herwig or Halyard shoot back the proper corrective action to take. The know-how of what to do is not only predicated on an intimate knowledge of the aircraft and all its components and systems, but also on possible previous experience with similar troubles. Sometimes it happens that the technical foreman had recognized symptoms of incipient malfunctions developing as the aircraft progressed from station to station, thus enabling him to anticipate a failure or at least prescribe a remedy in jig time.

By working together closely, the trouble shooters are often able to predict flight crew needs before they are requested, since certain problems are common to any aircraft.

Case in point, according to Tom

MORE COMFORT FOR PAA CREWS

Crew bunks on Pan American World Airways Boeing Stratocruisers used to be in the forward cargo compartment. This had two disadvantages: space available for cargo was curtailed and some crew members objected to being shut up in a dark and windowless hold. So PAA engineers installed these comfortable bunks on the flight deck, just behind the pilot's seat and across the aisle from the flight engineer. To make room for the double bunks, the radio operator's place was done away with completely, since PanAm now uses radio telephone (Aviation Week Dec. 11, 1950, p. 37) and the navigator's table and equipment was moved to the right side of the flight deck.

"I'm a BOEING engineer!"

You'll say that with pride. Men who can meet Boeing engineering standards share the prestige of leadership. They are doing vitally important work in the most challenging of all fields.

Boeing's Engineering Division has been growing steadily for 35 years. Today, it offers extraordinary career opportunities for the following:

Experienced and junior aeronautical, mechanical, electrical, electronics, civil, acoustical and weights engineers for design and research; servo-mechanism designers and analysts; and physicists and mathematicians with advanced degrees.

Here, at Boeing, you'll find stability and opportunity. You'll face the challenge of working on such vital programs as the B-47 and B-52 jet bombers, guided missiles and other revolutionary developments. Openings are available at both Seattle and Wichita. Your choice of location—the Midwest or Pacific Northwest. You'll enjoy good salaries that grow with you, and Boeing provides a moving and travel expense allowance.

Yes, you'll be proud to say, "I'm a Boeing engineer!"

WRITE TODAY TO THE ADDRESS BELOW OR USE THE CONVENIENT COUPON

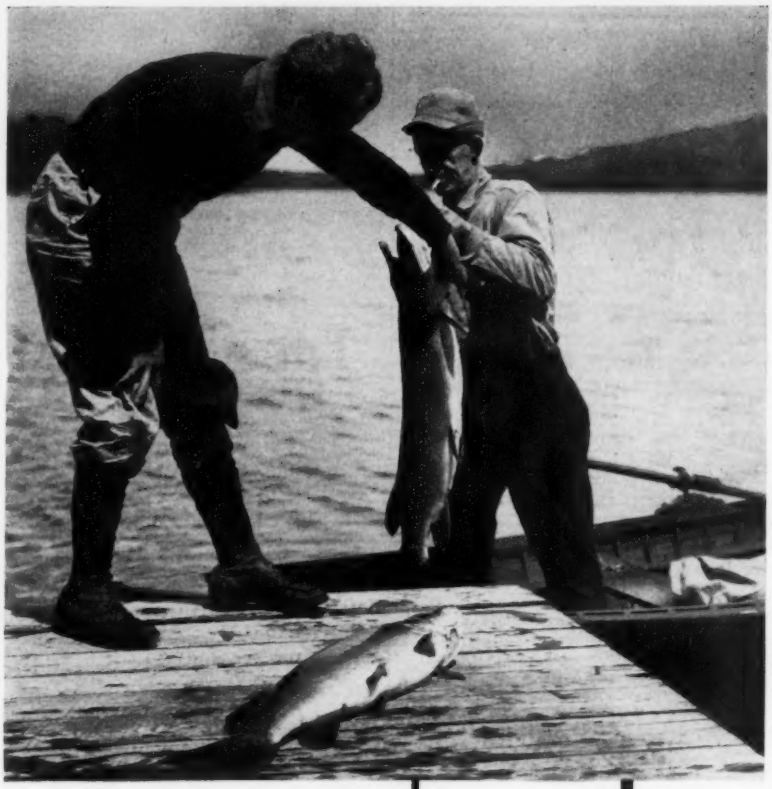
JOHN C. SANDERS, Staff Engineer—Personnel
DEPT. E-10
Boeing Airplane Company, Seattle 14, Wash.

Engineering opportunities at Boeing interest me. Please send me further information.

Name _____

Address _____

City and State _____



VINCO IS MASS PRODUCING PARTS FOR THIS MAN

He knew he could depend upon Vinco to deliver as specified, so he went fishing. Such confidence is the result of Vinco "METAL-WORKING WISDOM" which has been proven for more than 25 years. Whether it's gears, parts, assemblies or design and make, Vinco ingenuity will devise methods to deliver the job with less scrap and at less cost.

VINCO CORPORATION
9111 SCHAEFER HIGHWAY
DETROIT 28, MICH.

MASS PRODUCTION OF PARTS AND ASSEMBLIES
GEARS . . . SPLINES
ENGINEERING
DESIGNING

VINCO

MILLIONTHS OF AN INCH FOR SALE

THE TRADEMARK OF DEPENDABILITY

Linder, C&S director of engineering and maintenance, was a recent request by a Connie captain for a new and better type of seat cushion for the pilot's seat. Herwig got it for him and told Halyard who procured it for the DC-3 crews before they had gotten wind of it. They were naturally pleased by such a forward-thinking act.

That the technical foreman team has gained flight crew confidence is underlined by the fact that captains will call one of them from a station to ask for advice on a malfunction.

Still another benefit derived from this method is when malfunctions cannot be remedied at line stations, the technical foremen can make out the necessary work sheet prior to the plane's arrival. This reduces time wastage to a minimum and permits the extra work load to be efficiently scheduled with routine maintenance checks. The men are continually supervising mechanics' work to make sure that it is performed as meticulously as possible.

Linder said that this bridging the gap between flight crews and maintenance is paying off in morale as well as dollars and cents—the pilots now are assured that their squawks are heeded.

▶ **Stretching Transmitter** — W. W. Roodhouse, C & S's director of communications has a definite formula for keeping his avionic communications equipment in tip-top shape. Do as little as possible to your transmitters and receivers, he advises—"tinkeritis" is fatal to such equipment.

At C & S, three out of every four unscheduled removals are due to tube failures, he told AVIATION WEEK. Bearing out this theory, is his experience with the Bendix RTA-1-B transceiver. The set has the same unscheduled removal rate with a 1,600-hr. overhaul period as it did at 1,200 hr.

Although not original with C&S, grounded high frequency aircraft transmitter antennas are giving excellent results, according to Roodhouse. The H.F. set, a 100w. Collins 188-4, is consistently good for a range of over 3,000 miles. By grounding the antennas where they attach to the outboard fins (on a Connie), the directional characteristics of the antennas are changed at certain frequencies, the radiated range being increased some 25 to 40%.

How successful grounded antennas are is indicated by the fact that C&S frequently worked planes in California direct from Memphis. Moreover, since last December, the company has not failed once to work, directly, aircraft on the ground at Maiquetia Airport, Venezuela. Roodhouse said that the set's companion piece, the Collins 51-N receiver, is giving superior performance.

▶ **Cockpit Speaker**—C&S has just received CAA approval to install com-

aircraft manufacturers:

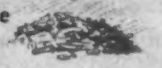
Here's what SOURCE INSPECTED BONDED STOCK means to you

The "Old" Way:

1 Fasteners shipped in bulk to you through your distributor without source inspection. This requires considerable paper work with certifications of chemicals and physicals. You must keep such paper in your files so you can dispose of the material if it becomes "Excess" or "Surplus".

2 Bulk storage complicates inventory control, makes possible mixing different types of fasteners and makes issuance to the assembly line costly and time consuming.

3 Fasteners in bulk, when declared surplus, have, in the past, been found to have little more than scrap value.



The Lamson SOURCE INSPECTED-BONDED STOCK WA

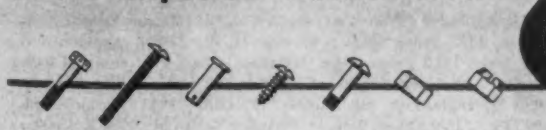
1 All fasteners sample inspected in accordance with approved sampling charts, inspection-stamped at the source. Individual cartons packed in easy-to-handle packing cases. No certification required—the sealed carton with inspection stamp is all that is needed.

2 Packages plainly labeled with contents . . . size, part number, specification, when manufactured and by whom. Storage and inventory control is greatly simplified. Withdrawal from stock or stores is quick and easy—no counting out—just so many unit packages or cartons.

3 Source Inspected Bonded Fasteners are "like money in the bank". If declared surplus they can be disposed of at market prices without "red-tape".

Remember **IT'S TRUE ECONOMY TO SPECIFY SOURCE INSPECTED-BONDED AIRCRAFT FASTENERS!**

Source Inspected—Bonded Stock



Lamson & Sessions

AIRCRAFT FASTENERS

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● While the booming billion dollar aviation industry . . . today's No. 1 Market supports many magazines . . . all of some merit . . . it has one overwhelming preference . . . AVIATION WEEK.

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Such a record of reader preference and clear-cut Circulation Effectiveness has naturally attracted a similar preference for the advertising pages of AVIATION WEEK.

AVIATION WEEK's total for the 9 month period (1951) was 1841.94 pages, Aviation Age 550.93, Aero Digest 532.74 and American Aviation 508.37. This represents an AVIATION WEEK gain of 592 pages over the similar period of 1950 . . . an increase that is alone more than the total advertising pages carried by any other aeronautical publication for the same 9 month period.

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bined speaker-amplifier units in the cockpits, one for each pilot. The units will give the crew greater comfort by eliminating need for head sets; the latter will still be carried in case of speaker-amplifier failure. Such failure will in no way affect operation of head phones.

The set being built in the airline's radio shops is completely self-contained, measures 8½ x 5 x 2¼ in; and weighs 2 lb.

It has a 2½w. undistorted power output and mounts a 5-in. Jensen speaker with a range of 250 to 6,000 cps.

▶**Stretching Tire Life**—G. D. Bruegger, C&S engineer has found a way of drastically cutting tire replacement costs. He has reduced the cost of a DC-3 landing to 24 cents. Comparably cheap landings will soon be forthcoming on the Connies, he predicted.

Theory behind Bruegger's scheme is that aircraft tires may be recapped several times before being junked, not just once or twice as most carriers do. Reason is that rolling mileage and calendar time on an aircraft tire are very small as compared to an automobile tire. Therefore, the strain imposed on the sidewalls of an aircraft tire, especially with rayon and nylon cord is relatively slight. C&S uses the Hawkinson method, which recaps only the crown of the tire, the part most subjected to wear. By recapping only the crown instead of bead-to-bead as in other processes, the sidewalls of the tire are not adversely affected by heat during the recapping process. This aids materially in keeping the sidewalls fresh and helps to prolong their life.

Bruegger said that C&S has gotten as many as seven recaps on DC-3 tires. It is interesting that there is no pattern of correlation between failures of new tires versus recaps. Actually, the airline says, it has never had a failure on a fifth or sixth recap tire. Nor has the airline established a maximum number of times a tire may be retreaded. When sufficiently worn, the tires are sent to the Shelly Tire Co. in Memphis. The tire is either recapped or rejected. In the latter instance, C&S is advised of the cause for rejection so that it may keep strict control over reasons for tire failure.

Maximum Connie tire retreads to date are three, but not enough time has been put on the planes to determine how high the number may go.

▶**Tire Statistics**—Here are some statistics:

- Average tire tread life on DC-3s—785 landings.
- Average cost per landing, including purchase of new tires and cost of recaps—24 cents.
- Average tire tread life on Constellations—300 landings on main gear tires; 190 on shallow tread nose gear tires.
- Average cost per landing—$2.40.

Bristol Automatic Control

GUARDS AIRCRAFT SAFETY AND OPERATING EFFICIENCY

Leading aircraft manufacturers use Bristol Automatic Precision Control Equipment on fighter planes, bombers and transports.

Products of over 60 years of Bristol pioneering in the field of precision instruments, they have proved their merit under exhaustive flight tests in extreme climates and at high altitudes.

What are your instrument control requirements? Bristol's Aircraft Division is especially geared to design and produce aircraft control devices such as engine temperature controllers, timers, and other electronic and electro-mechanical control devices.

The Bristol Company is a leader in the development of instruments and devices for indicating, recording and automatically controlling temperature, pressure, flow and other fundamental quantities.

With aeronautical development proceeding at a rapid pace, Bristol engineering and production facilities are available to solve *your* aircraft control problems.

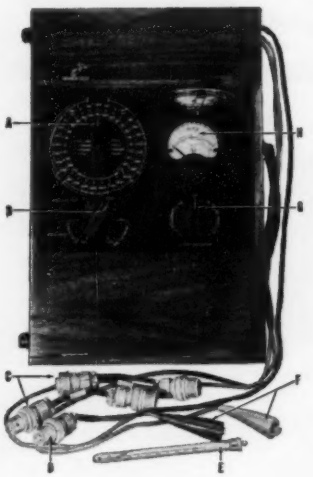
There are Bristol branch offices in 26 principal cities and Bristol factories in Chicago, San Francisco, Toronto and London. Address inquiries to The Bristol Company, Aircraft Equipment Div., at 130 Bristol Rd., Waterbury 20, Conn.

BRISTOL

FINE PRECISION INSTRUMENTS FOR OVER 60 YEARS

LEWIS

Aircraft Thermometer Testers



A Temperature selector switch
B Resistance-voltage selector switch
C Adaptors for connecting single ratiometers
D Resistance thermometer plug lead
E Liquid-in-glass thermometer
F Thermocouple thermometer clip leads
G Rheostat. H Standardizing voltmeter

PORTABLE WORKING STANDARDS . . . EASY TO OPERATE . . . FOR USE IN THE SHOP OR . . . IN THE AIRPLANE
SELF-CONTAINED BATTERIES . . . STURDY HARDWOOD CASE

Only a few simple operations are required to test temperature indicators with these instruments. Connect the indicator under test with the plug lead or the clip leads, turn the resistance-voltage selector switch as required, adjust standardizing voltmeter to a red line by means of the rheostat and turn the temperature selector switch to the calibration points. By comparing the indicator reading with the switch setting, the scale error is determined. Liquid-in-glass thermometer is used to determine ambient temperature when setting thermocouple indicators.

MODEL 81TT9 is provided with the following calibration ranges for Thermocouple Thermometers — 0 to 1000°C chromel-alumel, minus 50 to plus 350°C iron-constantan and minus 50 to plus 350°C copper-constantan. Calibration points for ratiometer are provided for the following in centigrade —70, —50, —30, —10, 0, 10, 30, 50, 80, 100, 120 and 150, for dual or single indicators, in accordance with the AN-B-19 Curve.

MODEL 81TT5 is provided with calibration steps similar to the 81TT9, except that a range of zero to 600°F copper-constantan is substituted for the 0 to 1000°C chromel-alumel range, to provide means of checking this type of indicator found on some commercial aircraft.

THE LEWIS ENGINEERING CO.

Manufacturers of Complete Temperature Measuring Systems for Aircraft.

NAUGATUCK, CONNECTICUT

(Note: The Connie tire cost figures are unusually high because they include the purchase price of original tires, $205, compared to $57 for a recap. Also included are the relatively high number of tires washed out as a result of pilot training on the airplane.) The Hawkinson method appears to be equally effective on any make of tire.

▶ **Inexpensive Brakes**—C&S is sold on the Goodyear single disc brake, according to Bruegger. He pulled out these data to substantiate his thinking:

- Cost of brake replacement parts for Goodyear multiple disc brakes on DC-3s. (8-mo. period)—$20,000.
- Comparable costs with dual disc brake—$14,000.
- Comparable costs with single disc brake—$8,100.

Other savings derived from the changeover, first to the dual then to the single disc brakes, considering the figures in that order, are:

- Failure frequency reduced from three to two to one per month.
- Yearly overhaul frequency jumped from 99 hr. to 240 hr. to 800 hr.
- Yearly number of man hours expended on brake overhaul skidded from 726 to 366 to 90.

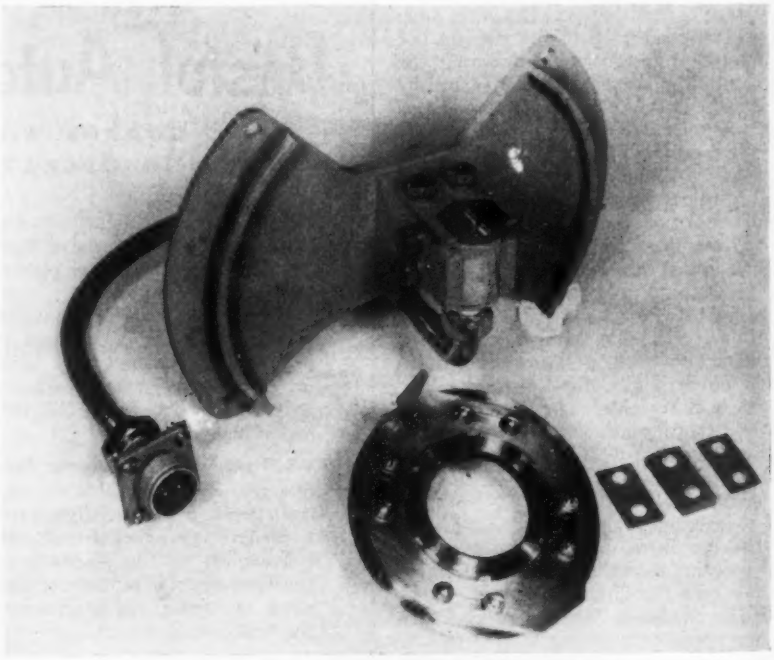
▶ **Better Heater**—The Adel fuel pumps, used to supply gas to the Connies' cabin heaters, gave considerable trouble, although identical units gave excellent results pumping anti-icing alcohol, according to R. L. (Doc) Anderson, C&S's director of research and development. A contributory reason for its failures as a heater fuel pump was because of continuous operation Anderson said.

At a recent Society of Automotive Engineers meeting, Anderson saw exhibited a Bendix automotive fuel pump that he thought might do the trick. A test installation on one heater gives every indication of proving him right. The installation has operated 774 flight hours (100 actual pump hrs.) and the only flaw detected was fuel seepage on one pump which was pulled as a precautionary measure.

The Bendix installation is economical. Cost of the two Bendix pumps is $20 against $90 for the Adel. The Bendix equipment draws ½ amp. at 24v., the Adel 2½ amp.

The new pumps operate on a solenoid-spring actuated, single piston principle. Advantages are:

- Pump automatically cycles at a rate directly proportional to heater demand; does not return excess fuel to the tanks.
- If one pump fails, the other can keep the heater at 70-75% of its output.
- The pumps are so cheap, they can usually be junked instead of overhauled.



SPERRY CRANKSHAFT TIMING PICK-UP

This Sperry Gyroscope Co. prototype, designed for use as an adjunct to the three-phase generator that locks the sweep appearing on its engine analyzer scope to a pre-determined crankshaft position, is expected to increase accuracy of timing analyzer-presented events to crankshaft position 500 percent over present methods (Aviation Week, Apr. 2). The pick-up is attached to the mounting bracket which is bolted to existing studs in the accessory section. Rotating armature is mounted to rear of accessory drive shaft. The unit is still in the experimental stage.

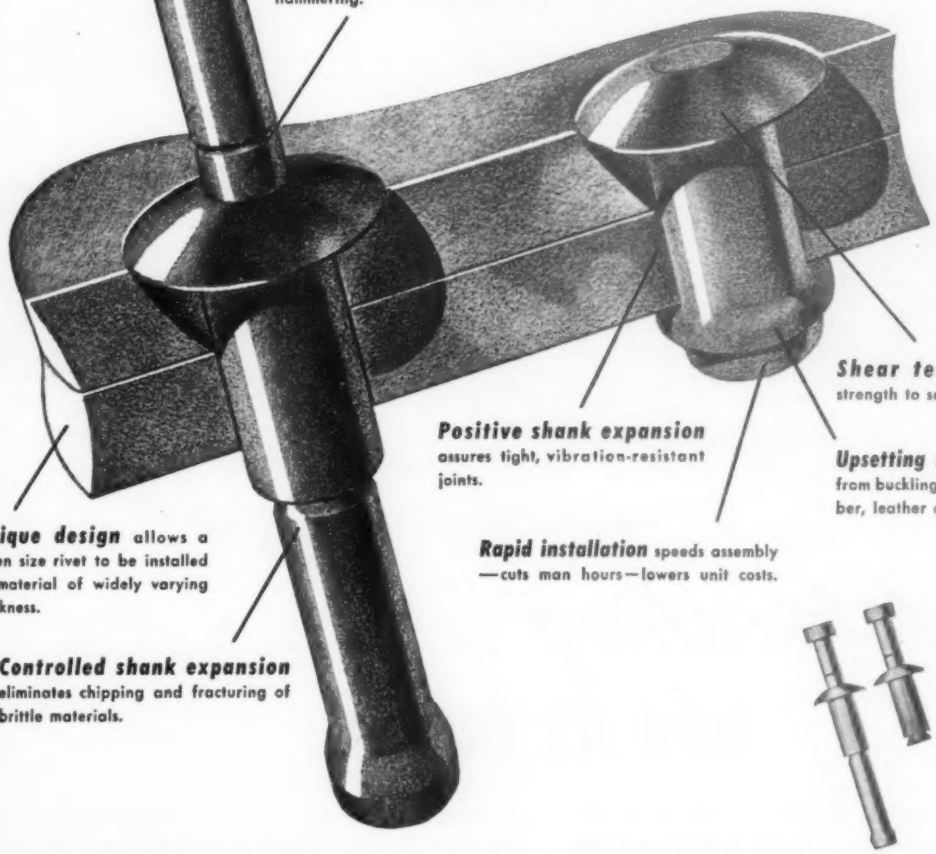
Here's why

CHERRY RIVETS

make the hard jobs easy

Installed **by one man from one side of the job.**

A pulling action **does the work —no twisting, no exploding, no hammering.**



Shear tests **show comparable strength to solid rivets.**

Positive shank expansion **assures tight, vibration-resistant joints.**

Upsetting method **prevents shank from buckling in soft materials like rubber, leather or fabric.**

Unique design **allows a given size rivet to be installed in material of widely varying thickness.**

Rapid installation **speeds assembly —cuts man hours—lowers unit costs.**

Controlled shank expansion **eliminates chipping and fracturing of brittle materials.**

For you, the particular value of Cherry Rivets may be the simplicity of installation. Or you may need the strength of Cherry Rivets and their vibration-resistance. But if you haven't met their money-saving advantages, take a moment today to ask for full information covering your applications.

Once you've realized the potential values in Cherry Rivets, your engineers and Cherry's can cooperate in determining the savings for your business.

Standard Cherry Rivets are available in five diameters, from 1/8" to 9/32". Special sizes manufactured on order.

Cherry Rivet

COMPANY

A Division of Townsend Company

CHERRY RIVETS ARE APPROVED BY U. S. NAVY, U. S. AIR FORCE AND CIVIL AERONAUTICS AUTHORITY. CHERRY RIVETS ARE PATENTED.

Cherry Rivet Company, Dept. J-110
231 Winston Street, Los Angeles 13, Cal.

Please send me further information describing Cherry Rivets: no obligation, of course. ☐ bulletin ☐ sample rivets

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NEW JET ENGINE

One of the most powerful turbojet engines in the world, the new Westinghouse J40 develops thrust equivalent to 14,000 hp at modern flight speeds. This power output will be approximately doubled by the addition of an afterburner.

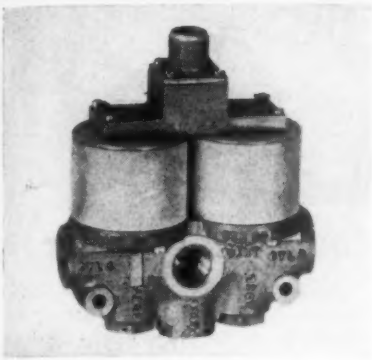
INTEGRAL AUTOMATIC ELECTRONIC CONTROL

This is the first turbojet engine with a completely integrated, automatic electronic control system to pass the stringent type test of the combined U. S. Military Forces. Complete operation from standstill to top altitude and speed is accomplished with a single cockpit control—leaving the pilot free to attend to navigation, battle tactics—battle itself. This is only one of the many distinctions of the J40 which place it in the forefront of today's jet propulsion field.

Look for further developments about the J40...it will spark a whole new group of speedier, high-performance military aircraft. Look to Westinghouse research and engineering for constant progress in jet aircraft power. J-54011

YOU CAN BE SURE... IF IT'S
Westinghouse
AVIATION
GAS TURBINES

NEW AVIATION PRODUCTS

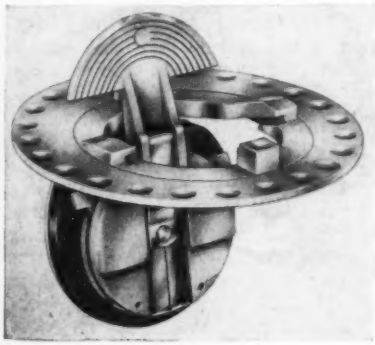


Plane Air Valve

A diversified line of valves, for use in high-pressure pneumatic systems in aircraft, has been placed on the aviation equipment counter by Adel.

Included in the line are three- and four-way solenoid-operated units, thermal relief valves and check valves. They are designed to operate with maximum efficiency under all service conditions with minimum leakage. The valve shown is a four-way solenoid-operated type. It's built to react instantly at pressures up to 3,000 psi.

Adel division of General Metals Corp., 10775 Van Owen St., Burbank, Calif.



Pressure Fuel Cap

A filler cap for pressurized fuel tanks in aircraft, that can be opened by hand and reportedly is one-third lighter in weight than its forerunners, is being produced by Gabb Special Products.

The new cap, dubbed "Safe-T-Lock," is designed to meet requirements of highspeed, high-altitude planes. It already has been service tested and now is being installed in three of the latest type jet fighters, the company reports.

The unit is built to seal at pressures up to 100 psi. It will open safely under pressure (tank vent valves are eliminated), the company says. It can be incorporated readily into present aircraft designs, according to Gabb, and is furnished as a self-contained unit with no detachable parts.

Gabb Special Products division, E. Horton & Son Co., Windsor Locks, Conn.

Torque Tests Speeded

All the various types of hand torque tools (anything from a tiny 1 in. lb. torque screwdriver to 7,500 ft. lb. torque wrenches) on the maintenance line or in the shop now can be tested and set accurately by a single, time-saving device recently developed to meet Air Force needs.

That's the claim of Richmont, Inc., for its new "Livermont Analizer," built to USAF Specification MIL-T-4188A. This precision equipment is accurate enough for laboratory work and rugged enough for daily shop work. With it, tools can be tested, set and adjusted in about one-fourth the time previously required with other testers and calibrators, the firm says. It is simply operated and personnel can learn quickly how to use it to check out hand torque tools.

The Livermont Analizer is entirely mehanical and is operated manually, so no external power source is required. Four separate stations on the unit check torque settings from 1-1,000 in. lb., 10-10,000 in. lb., 1-1,000 ft. lb., 10-7,500 ft. lb. Adaptors fit each station and "any or all recognized torque wrenches." Adaptors also can be supplied for testing tension exerted against cables, rope or wire. The tester weighs 200 lb., and with a set of adaptors is priced at $1,600 FOB Los Angeles.

Richmont, Inc., 808 Santa Anita Ave., San Gabriel, Calif.

Tiny Rectifiers

New subminiature selenium rectifiers (including standard instrument and spark suppressor types) are being produced in a variety of configurations for military and commercial applications by the Precision Rectifier division of Electronic Devices, Inc.

Stocked under the line name, "Minisel," the rectifiers can be supplied hermetically sealed and fungus-proofed. They are available with ratings up to 20ma. d.c. output and 25,000v. a.c. input per single stack. The units are constructed of matched ¼-in. dia. round selenium rectifier cells encased in Bakelite, glass or metal housings. Strict quality control is exercised in producing these rectifiers, says the firm, with resultant dependability permitting them

SOME PEOPLE SAID WE HAD

Holes in our Head

...WHEN WE SAID WE WOULD FLY FREIGHT AT AIR EXPRESS SPEEDS WITH RAIL EXPRESS RATES.

COMPARE FREIGHT RATES

Sample 100 lb. rates from West Coast to...	Chicago	Philadelphia	New York–Newark
Flying Tiger Air Freight	$10.50	$14.40	$14.70
Air Express	55.00	77.40	77.40
Air Parcel Post	72.03	80.00	80.00

COMPARE SPEED

Flying Tiger scheduled air freight takes your products across the nation overnight. 35 fast air freighters take single loads up to 20,000 pounds and are at your service 365 days of the year. Air freight is our exclusive business—we do not carry passengers, mail or express—instead your freight carries top priority all the time.

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Flying Tiger scheduled air freight gives you door-to-door delivery. The Flying Tiger Advance Manifest System enables immediate cargo identification and location at any time during transit. Freight on Flying Tiger freighters requires less crating than any other method of transportation—in many cases no crating at all.

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A standard Marman V-Band Coupling saves an hour in overhaul time on Pacific Airmotive's Model 138 Cabin Pressure Regulator. Replacing a conventional bolted joint, this coupling speeds assembly and disassembly with its patented quick coupler latch and provides a light weight positive seal that has passed method 61 of A.A.F. vibration requirements.
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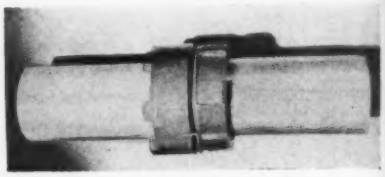
Standard Clamps for Special Applications

to carry a two-year guarantee in many applications.

Precision Rectifier division, Electronic Devices, Inc., 429-12 St., Brooklyn 15.



Fittings Cut Weight

Connectors for aircraft systems, claimed to cut weight of fitting installations up to 50% when used to secure tubing to tanks, pumps and other accessories, are being marketed by Flight Refueling Inc.

The pipe connectors are designed to replace AN fittings for large diameter tubes. They provide a fuel-tight joint, and cut assembly time to a minimum, the company says. The connectors can be used in pressure fueling systems, for oil, hydraulic and hot air lines. They are available for tubes from 1 to 4½ in. o.d.

Flight Refueling, Inc., Danbury, Conn.

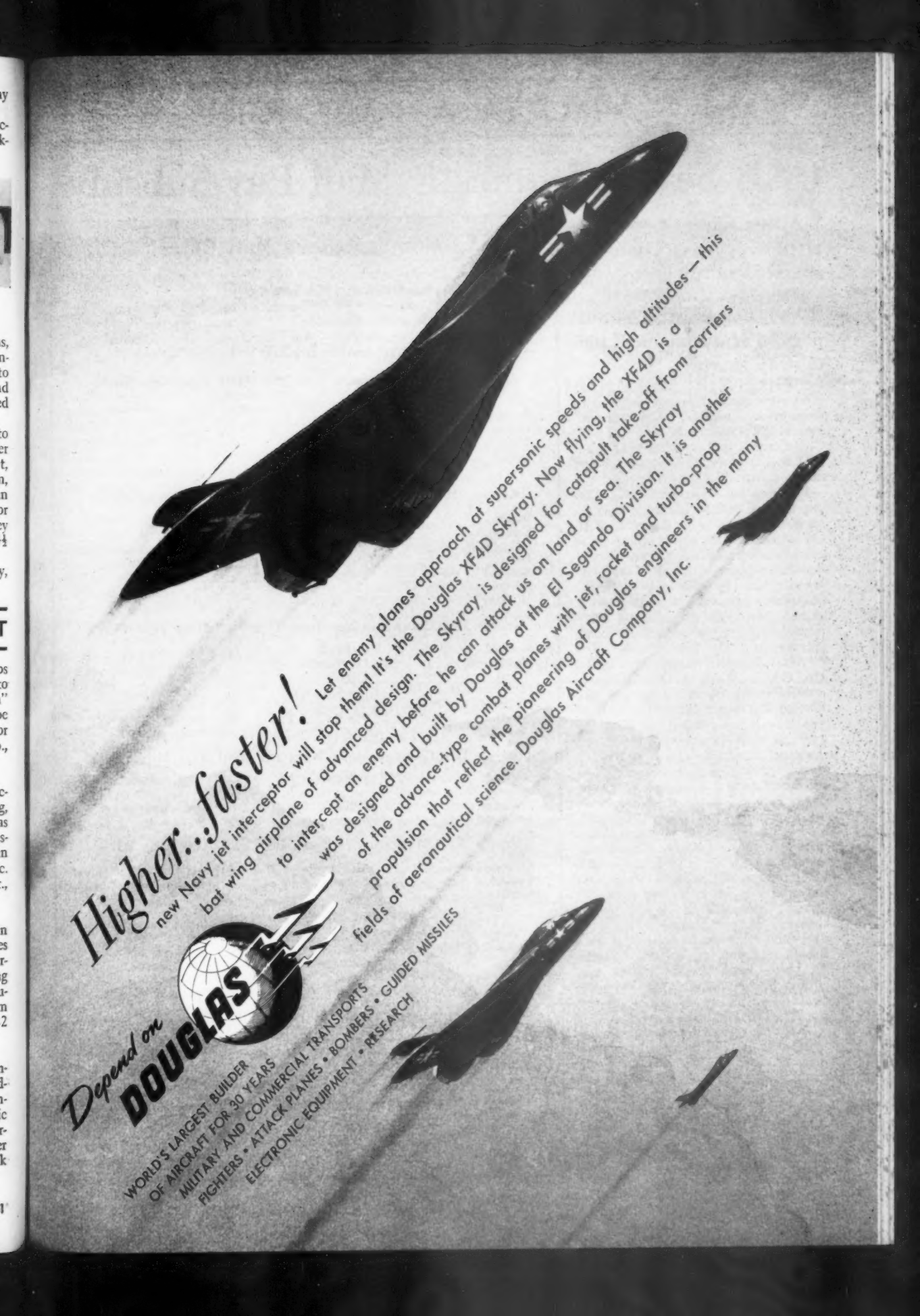
ALSO ON THE MARKET

Hard work is taken out of pulling jobs by converting Grip-O-Matic pullers to hydraulic power with "Power-Twin" ram. Quick-detach ram also can be used with push-pullers and on bench or pedestal presses. Owatonna Tool Co., 404 Cedar St., Owatonna, Minn.

Quik-Masks speed masking, give protection during spray painting, tumbling, etc. Available in standard shapes or as specified, these "Scotch Brand" pressure-sensitive masks come pre-cut, can be used to cover nameplates, dials, etc. W. H. Brady Co., 1602 E. Spring St., Chippewa Falls, Wis.

Thermipdix paint is available again in reasonable quantities. Paint undergoes color changes at predetermined temperatures, is useful in studying heat-treating processes, heat-transfer qualities of lubricants, protecting equipment from overheating, etc. Tempil Corp., 132 W. 22 St., New York 11.

"Rustshield 2" hot immersion compound is said to turn iron and steel sliding or bearing surfaces into corrosion-resistant, highly absorbent, non-metallic areas, increasing capacity of these surfaces to retain lubricating oils for longer periods. Octagon Process, Inc., 15 Bank St., Staten Island 1, N. Y.


Higher...faster!
new Navy jet interceptor will stop them! It's the Douglas XF4D Skyray. Now flying, the XF4D is a bat wing airplane of advanced design. The Skyray is designed for catapult take-off from carriers to intercept an enemy before he can attack us on land or sea. The Skyray was designed and built by Douglas at the El Segundo Division. It is another of the advance-type combat planes with jet, rocket and turbo-prop propulsion that reflect the pioneering of Douglas engineers in the many fields of aeronautical science. Douglas Aircraft Company, Inc.
Let enemy planes approach at supersonic speeds and high altitudes — this
Depend on
DOUGLAS
WORLD'S LARGEST BUILDER OF AIRCRAFT FOR 30 YEARS
MILITARY AND COMMERCIAL TRANSPORTS
FIGHTERS • ATTACK PLANES • BOMBERS • GUIDED MISSILES
ELECTRONIC EQUIPMENT • RESEARCH

CAB Severs Domestic Mail Pay-Subsidy

● Action gives a reliable picture for first time of government support.

● And Board expects this portion of our air mail bill to drop sharply.

Squarely meeting congressional criticism for its "manana" attitude toward separating airline subsidy from mail pay, Civil Aeronautics Board last week fixed definite compensatory rates for all domestic carriers.

Pay over and above each compensatory rate will be flatly labeled "subsidy," for the first time giving Congress, Post Office Department, and other interested quarters a reliable picture of government support to air transportation. It will also give railroads powerful propaganda ammunition for their drive against "favored" government treatment being given to their airline competition.

► **"Always Manana"**—Only a few months ago, CAB's Chairman Donald Nyrop testified before Senate's Interstate and Foreign Commerce Committee that it would be impossible for the Board to arrive at compensatory mail rates for domestic carriers by June 30, 1952. Rates would be separately established for each carrier and only after "orthodox procedure," involving lengthy hearings, he said. This brought the irate observation from the committee's chairman, Sen. Edwin Johnson: "It's always manana with CAB. The Board would never separate the subsidy element to the airlines, if left to its own devices."

Almost immediately, Board policy changed. Nyrop announced a 45-cents-a-ton-mile compensatory rate for the Big Four—American Airlines, Eastern Air Lines, Trans World Airlines, and United Air Lines—and stated that rates for the remaining domestic carriers would be fixed by Sept. 30.

To fulfill this assurance, the Board abandoned its "orthodox procedure" approach, and divided carriers into seven groups, according to the unit cost of their operations. The compensatory rate, ranging from 45-cents-a-ton-mile rate of the long-haul heavy-traffic Big Four to $7.26-a-ton-mile rate for short-haul low-traffic local lines, was geared to the operational cost and in-

Compensatory Mail Rates

Following are the "compensatory" mail rates for domestic air carriers established by Civil Aeronautics Board for the 1951 fiscal year, the current 1952 fiscal year, and the anticipated rates for the 1953 fiscal year. The compensatory rate will not necessarily be the total rate the Board will certify for payment by the Post Office Department. But additional pay, over and above the compensatory rate, will be labelled "subsidy."

Group I: Compensatory Rate Per Mail Ton Mile $0.45

1951	1952	1953
American	American	American
Eastern	Eastern	Eastern
TWA	TWA	TWA
United	United	United
....	Northwest	Northwest

Group II: Compensatory Rate Per Mail Ton Mile $0.53

Braniff	Braniff	Braniff
Capital	Capital	Capital
Chicago & Southern	Chicago & Southern	Chicago & Southern
Delta	Delta	Delta
National	National	National
Northwest	....	....
Western	Western	Western

Group III: Compensatory Rate Per Mail Ton Mile $0.75

Colonial	Colonial	Colonial
Continental	Continental	Continental
Inland	Inland	Inland
Mid-Continent	Mid-Continent	Mid-Continent
Northeast	Northeast	Northeast
....	Pioneer	Pioneer
....	....	Piedmont

Group IV: Compensatory Rate Per Mail Ton Mile $0.91

Piedmont	Piedmont	....
Pioneer	....	....
Robinson	Robinson	Robinson
Southwest	Southwest	Southwest

Group V: Compensatory Rate Per Mail Ton Mile $1.48

All American	All American	All American
Bonanza	Bonanza	Bonanza
Empire	Empire	Empire
Frontier	Frontier	Frontier
Trans-Texas	Trans-Texas	Trans-Texas
West Coast	West Coast	West Coast
Wisconsin Central	Wisconsin Central	Wisconsin Central
....	Lake Central	Lake Central
....	Ozark	Ozark
....	Southern	Southern

Group VI: Compensatory Rate Per Mail Ton Mile $2.58

Lake Central	....	....
Ozark	....	....
Southern	....	....
....	Central	Central

Group VII: Compensatory Rate Per Mail Ton Mile $7.26

Central	....	....
Mid-West	Mid-West	Mid-West
Wiggins	Wiggins	Wiggins

cludes, in addition, allowance for an 8% return to the carrier.

The compensatory rate also reflects "cost of service," based on revenue ton miles per station served. This criterion, the Board stated, gives account to these factors: length of traffic haul and average distance between stops; density of traffic; volume of operations.

▶**Without Consideration**—The rates were established, the Board admitted, without consideration of the individual operating factors of carriers, and without consultation with the carriers. But the Board promised that "adequate opportunity will be provided to obtain the viewpoints of all parties" to refine progressively the separation formula in the future.

The Board's new action is consistent with the Senate-passed Johnson bill directing separation. That measure establishes five categories of compensatory rates, ranging from 45 cents to $1.80 a ton mile, but only until and when the Board sets different rates.

The Johnson Bill authorizes subsidy grants to carriers in the "commerce" and "national defense" interests. The grants, under the measure, would be made from appropriations to CAB; Post Office Department would only be required to pay the compensatory rate for transporting mail.

Until such legislation is enacted, Post Office will continue to pay the mail rate certified by CAB, which will include the subsidy portion as well as the compensatory portion.

The Board reiterated its intention of fixing compensatory rates for international carriers by June 30, 1952.

▶**Subsidy Outlook**—The Board gave the following outlook for airline subsidization under the compensatory rates which have been established for the domestic carriers:

- Out of the total domestic mail pay of $61.9 million in 1951 fiscal year, $27.4 million was compensatory pay and $34.5 was subsidy.
- Out of the anticipated $57.3-million total mail pay for the current 1952 fiscal year, $29.6 million will be compensatory and $27.7 million will be subsidy payment.
- By the 1953 fiscal year, the total mail bill will go down to $55.9 million—$31.8 million compensatory and $24.1 million subsidy payment. This would reflect a 30.2% reduction in subsidy from the '51 fiscal year.

The Board also pointed out that over the 13-year period since enactment of the 1938 Civil Aeronautics Act, Post Office has lost only an average $4.3 million a year on air mail service. Payment to carriers, plus the cost of running the air mail service, totalled $775 million over the period; revenues from air mail postage added up to $718 million.

D. F. Magarrell

D. R. Petty

J. A. Herlihy

Top Positions Change at United

A measure of United Air Lines' concern over a drop in employe morale and a series of not easily explainable crashes is seen in a reshuffling of top operations and maintenance management.

"To increase efficiency and to provide closer direction of major components of the company's operations organization," President William A. Patterson announced these changes:

- **J. A. Herlihy**—From vice president-operations to vice president-engineering and maintenance.
- **D. R. Petty**—From flight supervisor to vice president-flight operations.
- **D. F. Magarrell**—From vice president-passenger service to vice president-transportation services, taking over responsibility for all ground service operations as well as in-flight passenger service.

Reporting to Magarrell will be O. T. Larson as assistant vice president-transportation services; O. C. Enge, as general manager of passenger service; and S. V. Hall as general manager of ground services. All three are UAL veterans.

The fact that Herlihy and Petty are long-time UAL pilots may be a significant aspect of the reorganization when viewed in the light of pilot discontent with deadlocked contract negotiations and the possibility that the personnel factor may have contributed to the causes of the recent crashes.

BEA Head Sets Copter Time-Table

What is the minimum-size helicopter needed to operate profitable helicopter passenger service?

Nothing smaller than a 40-passenger type, says Peter Masefield, chief executive of British European Airways. "When we can operate large passenger helicopters from city center to city center for distances up to about 200 mi. between stops, then I am sure we shall have a saleable means of transport which will scoop the pool," BEA's head man asserts. He sees this situation in action in 1965.

Here's how Masefield projects the development of a satisfactory rotary-wing type for BEA service:

- **1953**—Experimental operations with one Bristol 173 carrying 12-14 passengers.
- **1955**—Preliminary scheduled service with 173s.
- **1957**—Introduction of a developed and enlarged version of the 173.
- **1960**—Preliminary services with a large commercial copter.
- **1965**—The large copter established as an economic commerical carrier.

CAB Delays Change In Cockpit Rules

Civil Aeronautics Board has delayed the effective date of its cockpit standardization requirement for new planes. So none of the commercial transports now on order will be required to meet the cockpit standardization requirement.

The regulation would have applied to Convair-Liner 340s and Super Constellations, the two latest transport designs awaiting certification. But United and other airlines asked for waivers for their planes on order.

Meanwhile some of the experts started coming up with desirable changes in the layout proposed by the regulation.

Main reason for the delay is that Society of Automotive Engineers' cockpit standardization committee, including many leading pilots and aeronautical engineers, will finish a detailed study of the problem soon.

CAB has postponed consideration of re-issuing the cockpit standardization regulation—Amendment 4B-2 to Part 4B of the Civil Air Regulations—to Apr. 1 of next year.

U.S. Transport Planes in Service

	Douglas DC-6	Douglas DC-4	Douglas DC-3	Lockheed Constellation	Convair 240	Martin 202	Curtiss C-46	Boeing 377
Scheduled								
Domestic Trunk &								
Local Only	48	66	385	46	24	12	0	0
Cargo Only	1	9	2	0	0	0	52	0
Intra-State	0	1	11	0	0	3	0	0
Int'l Only	6	59	56	18	16	0	10	28
Int'l & Dom	84	70	20	50	79	2	0	17
Nonsked	0	43	36	0	0	3	89	0
Total	139	248	510	114	119	20	151	45

Compiled by CAA as of Sept. 1, 1951.

U.S. Airliners on Order

(As of Oct. 1, 1951)

Civil Airliners		
Convair-Liner 340	U. S. Orders	97
	Foreign Orders	6
Douglas DC-6B*	U. S. Orders	73
	Foreign Orders	33
Douglas DC-6A*	U. S. Orders	8
Lockheed 1049	U. S. Orders	40
	Foreign Orders	27
Martin 4-0-4	U. S. Orders	101
Total Civil		385
Military Conversions		
Convair-Liner T-29	USAF Order	Over 80
Douglas DC-6A	USAF & Navy	Over 50
Lockheed 1049	USAF & Navy	81
Martin 4-0-4	USCG	2
Total Military Conversions		213
Grand Total		598

* Douglas has already completed orders for another 19 DC-6Bs and 1 DC-6A.

Squeeze on Civil Air Production

NPA Aircraft division appeals to DPA to restore first-quarter 1952 material cuts to "B" manufacturers.

Washington showdown loomed last week on just how important national policy makers think continued civil aircraft production is to mobilization.

Until now, transport aircraft manufacturers have been getting enough materials to keep their mixed liens of some military and some civil planes moving.

But last week Defense Production Administration, faced by materials shortages, clamped down. They slashed first-quarter 1952 alloments of aluminum, steel and copper for transport aircraft and military plane parts drastically.

► **Cuts Proposed**—Cuts of 11 to 39% in controlled materials for aircraft B products were proposed by DPA. All civil aircraft plus vital components of military aircraft are B products.

NPA interpreted this cut as forcing recall of all civil aircraft allotments, if it stands, before any military plane part allotments are recalled. Revised allotments do not even provide enough for stated requirements of military plane parts alone, even if all transport production stopped. The 11-to-39% cut from original requests measured out to considerably more than the civil share of the aircraft B products list of materials requirements.

But this was only the first tentative DPA allocation. Deputy Commerce Undersecretary Philip Hollar described it as just a part of the first attempt of the small DPA staff to wrestle with shortages facing a hundred first-quarter industry programs. Hollar is a member of the DPA program adjustment staff that will review and revise these first tentative DPA staff recommendations.

► **Prompt Appeal**—National Production Authority's Aircraft division filed prompt appeal to the DPA Program Adjustment Committee. NPA asked DPA to restore the full allotments originally requested as the minimum requirement for first-quarter civil aircraft and military plane parts production. NPA Aircraft division computes quarterly materials requirements on all these so-called "B" products for aircraft (military aircraft parts plus whole civil aircraft). Then NPA Aircraft division requests the necessary allotments of controlled materials from DPA.

When NPA officials first got the tentative cuts from DPA last week they speculated that the cuts were an accident or DPA misunderstanding. They predicted that the DPA Program Adjustment Committee would later restore about all the aircraft materials requirements they programed.

Before this happens, however, the question may go to much higher policy levels in Munitions Board, Air Coordinating Committee, Aircraft Production Board and finally Office of Defense Mobilization.

► **Parts Concerned**—The military plane parts that are B products include: landing gear (struts, wheels, and brakes), aircraft heaters (de-icing, cabin, etc.), aircraft pumps, hydraulic control systems, ignition harness, engine stands, aircraft fuel metering systems, and other components.

In its appeal to the DPA Program Adjustment Committee, NPA Aircraft division states: "If adjustment is not made, the proposed severe cut-back from our stated firm requirements will permit this division to:

• **Only partially cover** screened military aircraft 'B' product requirements, and will necessitate a

• **Recall of all advance allotments** covering civilian aircraft production."

All civil aircraft advance allotments might be recalled because NPA reportedly has orders that military requirements come first. This is despite the original Air Coordinating Committee policy statement that civil transports are essentially military potential production items, deserving equal priority with military aircraft production. Four-engine transports are subject to 48-hour call to military service.

► **Manufacturers Affected**—The DPA cut would affect Convair, Douglas, Lockheed and Martin transport assembly lines, among others, according to NPA Aircraft division. And military versions of these civil transports are scheduled for production at various parts of the line. The 385 civil transports now on order from these four companies are scheduled at about 165 planes a year. Mixed in with the civil models are another 200-odd military versions of the same planes on the same assembly lines.

DPA cuts bring the requested amounts of steel, aluminum and copper for first quarter, 1952, well below the adjusted rate already issued by NPA for the current quarter, fourth quarter,

DPA-Proposed Slash of B Products Allotment

(First Quarter, 1952)

	NPA requirements (estimated)			Tentative DPA allotment	
	Civil planes	Military plane parts*	Total	Amount	% cut from NPA request
Carbon steel, (tons)	205	3,038	3,238	2,880	11%
Alloys steel, (tons)	1,341	8,859	10,200	8,440	17%
Stainless steel, (1,000 lb.)	435	2,206	2,641	2,160	18%
Wire mill copper, (1,000 lb.)	68	958	1,026	775	25%
Brass mill copper, (1,000 lb.)	82	100	182	163	10%
Foundry copper, (1,000 lb.)	69	871	940	770	18%
Aluminum (1,000 lb.)	4,599	5,270	9,869	6,000	39%

* B product aircraft components, standard items, of which about 5% are for civil aircraft production and 95% are military.

1951. In fact, the allotments which were asked were closely in line with fourth-quarter allotments, throughout.

In its appeal, NPA Aircraft division says one explanation for the cut is that DPA may only have reviewed the direct NPA aircraft allotment issuance data, rather than the full NPA aircraft allotment.

▶**APRA Concerned**—Difference would be that NPA Aircraft division turns over civil transport aircraft allotments to the Munitions Board's scheduling unit—the Aircraft Production Resources Agency (APRA). So if DPA looked only at the list of direct issuance of NPA allotments, it would have found NPA-requested aircraft materials exceeded NPA aircraft issuance requirements.

The difference is very close to the transport allotments turned over to APRA for military issuance of controlled materials allotment symbol A-1.

But even this discrepancy would not account for all of the DPA cut.

▶**Too Early to Tell**—Regardless of what final disposition DPA Program Adjustment Committee makes of the tentative materials cuts, it's too early to tell effect on production with any degree of accuracy. One reason is that some of the first-quarter cuts might possibly be absorbed by manufacturer inventory run down. That would be dangerous, of course, if second-quarter allotments didn't make the first-quarter drain good. It also might work out all right for some aircraft companies, yet work havoc for others.

Predicting the effect of materials cuts on final airframe assembly lines is further complicated by the fact that engine deliveries are generally lagging behind air frame manufacturers' capacity to assemble.

But one clear lesson on this stands out, according to industry observers (AVIATION WEEK Oct. 1, pp. 13-14). Munitions Board schedules the complex production of aircraft through final assembly, yet allocates only part of the materials components. So it's doubly hard to predict effect on aircraft production when other agencies like DPA and NPA are programming materials for some military plane parts and all civil transports on military assembly lines.

British Haven't Won Jet Race: Gross

Lockheed President Robert E. Gross doesn't think the British have won the jet airliner race yet.

"I don't honestly believe the British liners have the range to make them practical for operation over ocean routes and I do not think they have low enough operating costs to make them profitable over land routes," Gross told the American Bankers Assn. last week.

The U. S. could "easily" build a jet transport that could fly from Los Angeles to New York in four hours, or Los Angeles to Chicago in 2 hr. 56 min., or Chicago to New York in 1 hr. 17 min. at equal or better profit margins than are now accomplished, the transport designer and builder told his audience.

On the subject of missiles, Gross said that the long range guidance system is the key to the whole program. "It's not hard to build just a missile of any range," he said.

▶**War Spending**—Turning to the immediate problems of getting America's highly complex warplanes into production, Gross told the bankers that crisis spending is the only extravagance in America's air-power program.

Part of the higher price is due to need for new and bigger machinery. Equipment complexity plays its part too. "A patrol bomber built early in World War II was loaded with 100 lb. of instrumentation. . . . Today's counterpart has 582 lb." A particular plane made in 1943 carried almost a 1,000 lb. of electronic gear; the comparable plane today has well over 5,000 lb.

In 1943, Gross said, Lockheed employed one electronic technician for every 1,000 employes; the ratio now is 1:24. And where one in 22 employes was an engineer, the ratio is now 1:8.

▶**Crystal**—Gross detailed a four-fold prediction of aeronautical things to come, based on present aviation scientific knowhow:

- **An American 600-mph. jet airliner** that will carry 26,600 first class passengers a year across the Atlantic, with eight-hr. utilization daily (possibly the proposed Lockheed L-193 discussed in AVIATION WEEK June 18, page 19).
- **A long-range guided missile** with a guidance system that will steer accurately around the curve of the earth's surface. Gross said: "We have a fine start on this (guidance) problem."
- **An everyman's airplane** using boundary layer control principles and a ducted fan engine, capable of hovering, vertical takeoff or flight at high or low speed in any direction.
- **A practical space ship.** Gross said that the first phase of space flight: How to build a ship that will get out into interplanetary space, with three stages of propulsion, taking it up to 24,000 mph., already is known. Solving of later phases of space flight: How to get the craft back safely to an earth landing, or how to get it to the moon with enough energy to climb back out, are to be solved "and will come," he added.

ICAO, IATA to Meet In Buenos Aires

(*McGraw-Hill World News*)

Buenos Aires—Air transport problems in the South Atlantic and South America are scheduled to get a thorough airing at ICAO's regional air navigation conference to be held here over a period of three weeks beginning Oct. 30. IATA will hold a preliminary meeting Oct. 23. Government officials from North and South America are expected to be present. Seven action committees have been formed.

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Oct. 8-10—Special conference on aircraft electrical applications, sponsored by the air transportation committee of the American Institute of Electrical Engineers and the Los Angeles section of the Institute, Hollywood Roosevelt Hotel, Hollywood.

Oct. 9—Air transport section, National Safety Council, Palmer House, Chicago.

Oct. 11-12—1951 conference on airport management and operation, University of Oklahoma, Norman, Okla.

Oct. 13-14—Air fair at Los Angeles International Airport.

Oct. 15-18—Society for Non-Destructive Testing, eleventh annual meeting, with symposium on jet engines part inspection, Hotel Detroiter, Detroit.

Oct. 16-17—Fourth annual New York State conference on airport development and operations, sponsored by the N. Y. State Dept. of Commerce, N. Y. Aviation Trades Assn., Assn. of Towns of the State, Conference of Mayors, County Officers' Assn. and the N. Y. State Flying Farmers, Onondaga Hotel, Syracuse, N. Y.

Oct. 19—Meeting of the New York section of the American Rocket Society, including a talk, Failures in the V-2 Program, by Dr. Porter of General Electric, 29 W. 39 St., N. Y. 18, N. Y.

Oct. 19-20—Meeting of the Engineers Council for Professional Development, Hotel Statler, Boston, Mass. For information write: Miss Elsie Murray, 33 W. 39 St., N. Y. 18, N. Y.

Oct. 22-24—National Electronics Conference & Exhibition, Edgewater Beach Hotel, Chicago, Ill.

Oct. 24-25—1951 annual convention of the National Assn. of State Aviation Officials, Arizona Inn, Tucson, Ariz.

Oct. 29-30—Air Industry & Transport Assn. of Canada, annual general meeting, Seigniory Club, Montebello, Quebec.

Oct. 29-31—National transportation meeting of Society of Automotive Engineers, Hotel Knickerbocker, Chicago.

Oct. 31-Nov. 1—Society of Automatic Engineers, fuels and lubricants meeting, Drake Hotel, Chicago.

Nov. 7—Annual Wings Club Dinner, Waldorf-Astoria, New York.

Nov. 8-9—Seventh annual national conference on industrial hydraulics, sponsored by the graduate school of Illinois School of Technology and Armour Research Foundation, Sherman Hotel, Chicago.

Nov. 16—Annual business meeting of the American Rocket Society, 29 W. 39 St., N. Y. 18, N. Y.

Nov. 28-30—National convention of the American Rocket Society, Atlantic City, N. J.

Nov. 30-Dec. 5—Meeting of the American Society of Mechanical Engineers, Chalfonte Haddon Hall, Atlantic City, N. J. For information write: Ernest Hartfort, 29 W. 39 St., N. Y. 18, N. Y.

PICTURE CREDITS

12—McGraw-Hill World News; 13—(SA.4) Combine; (P.1067) Derek H. Wood; 18—Steven Detzian; 69—United Air Lines.

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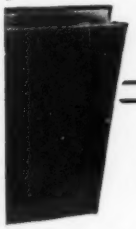

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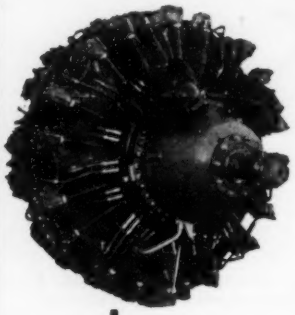

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35	RA10-DB	Receiver
20	TA-12B	Transmitter
150	DA-1F	Dynamotor

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Quantity	Part No.	Description
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500	3506	Flange
130	8288	Follower Ass'y
814	35814	Blower Ass'y
22	36759	Rod Ass'y
182	46400E	Liner
30	48346	Cylinder
53	48362	Shaft
175	48363	Shaft
56	48392	Sump
390	48461	Gear
78	76236	Gear
1178	84289	Bearing
113	84487	Housing
77	84591C	Nose Housing
200	48350-D	Crankcase Ass'y
200	84083	Cylinder
100	84084	Cylinder
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3000	KF4H
30000	KP4R16-2
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28000	KS6A
34600	NR6L12
7000	38KD4
6600	RE3MR3
5000	F35-14

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Quantity	Part No.
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161	420 EC
160	420 DY
26	550 CD
14	550 CG
195	550 AJ
195	550 CP
104	550 EC

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Quantity	Part No.	Mfg.
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53	AN6203-3	Bendix-10°-1500 P.S.I.

LIGHT ASSEMBLIES

Quantity	Part No.	Mfg.
2000	AN3096-4	Grimes (Amber)
800	AN3096-5	Grimes (Red)
380	AN3096-6	Grimes (Green)

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Quantity	Part No.	Mfg.
478	D9530	Adel
233	D9530	Adel
428	D9560-2	Adel
744	D10044	Adel
2200	AN4078-1	United Aircraft (Oil Dilution)
88	572-3A	Eclipse
244	D10051	Adel

BLOWERS

Quantity	Part No.	Mfg.
25	U702-15	Joy
16	125J-6	Dynamic Air Eng.
43	458-AA-6C	Dynamic Air Eng.
24	8861G-6C	Dynamic Air Eng.

OIL COOLER ASSEMBLIES

Quantity	Part No.	Mfg.	Description
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38	18597-2	Airesearch	Aluminum (Width 8") (Length 9")

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230	MF9-713-15A	Vickers	Hydraulic
90	AN6102-1(8818-2)	Adel	Fuel
160	3E492E	Pesco	Fuel
700	TFD 8600	Thompson	Fuel Booster
125	D7818	Adel	Anti-icer
170	2P771-A	Pesco	Fuel Booster
250	AN4014	Erie Metvr	Wobble (D-3)
300	1H260-K & KA	Pesco	Hydraulic

INSTRUMENTS

22	AN5531-1	G. E.	Tach. Generator
1000	AN5780-2	G. E.	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Same as above
1000	AW2-65B	U. S. Gauge	Air Pressure Gauge
16	76B19	Lewis Eng.	Cyl. Head Temp.
10	46B2	Lewis Eng.	Air Temp. Ind.
31	47B21	Lewis Eng.	Temperature Ind.
12	47B22	Lewis Eng.	Temperature Ind.
20	47B23	Lewis Eng.	Temperature Ind.
36	47B24	Lewis Eng.	Temperature Ind.
10	76Z2	Lewis Eng.	Air Temp. Ind.
11	76B4	Lewis Eng.	Temperature Ind.
20	77C4	Lewis Eng.	Temperature Ind.
21	77C5	Lewis Eng.	Temperature Ind.
85	727TY72Z2	Weston	Left Wing Anti-icing
88	727TY73Z2	Weston	Right Wing Anti-icing
83	727TY74Z2	Weston	Tail Anti-icing
11	2227-11D-3A	Eclipse	Dual Tachometer
22	8DJ-29-AAY	G. E.	Indicator (Cowl Flap)
45	254BK-6-052	Kollsman	Differential Pressure Ge.
25	906-6-011	Kollsman	Dual Altimeter and Differential Pressure Ge.
8	14601-1G-B1	Eclipse	Altitude Gyro
22	15100-1B	Eclipse	Pitch Trim Ind.
10	20000-8A-14	Eclipse	Magnesym Position Ind.
23	20100-11C-4-A1	Eclipse	Magnesym Wing Flap Ind.
40	23000-2A	Eclipse	Position Transmitter
25	46N2	Jaeger	24 Hour Clock

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50	RBD2220	Holtzer Cabot	DC Motor
49	FD65-5	Diehl	Motor
47	FD65-6	Diehl	Motor
116	A371205	Dumore	Motor
780	A371206	Dumore	Motor
115	P4CA2A	Parker	Primer
80	AN3213-1	Scintilla	Ignition Switch
568	A-9 (94-32226)	Nasco	Ignition Switch
687	RS-2	Mallory	Selector Box
90	JH950-R	Jack & Heintz	Starter Motor
492	S-841 (94-32253)	Electronic Labs	Box
8	FA122	Wallace & Tiernan	Flasher
1000	13018-A	Bendix	Interphone Box
140	K14949E	Marquette	Windshield Wiper Kit
73	3123-3A	Eclipse	Warning Unit
188	EYLC-2334	Barber-Colman	Control
11	12086-1C	Eclipse	Amplifier
174	450-0	Skinner	Gasoline Filter
250	558-1A	Eclipse	Oil Separator
100	564-2A	Eclipse	Oil Separator
100	716-3A	Eclipse	Generator (NEA-3A)
5	656536-421	Sperry	Controller Pedestal (A-12)
37	117-47	Edison	Detector
89	318	Edwards	Horn
280	921-B	Stewart-Warner	Heater (200000 BTU)
340	981280	Kidde	Co2 Cylinder
85	12924-2	Adel	Lock Valve
90	923748	Kidde	Oxygen Cylinder
80	DW28	Eclipse	Transformer
97	6041H-146A	Cutler Hammer	Relay (B-12)
22	0655-D	Aro	Oxygen Regulator
22	M-2031	Air Associates	Actuator
148	PG208AS1	Minn. Honeywell	Air Ram Switch
33	DW47	Eclipse	Transformer
11	DW33	Eclipse	Transformer
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750	ND21	American Gas Accumulator Co.	Time Delay Relay
30	UA-3150	United Air Prod.	Oil Temp. Reg. 5"
29	UA-3160	United Air Prod.	Oil Temp. Reg. 6"
95	UA-3160C	United Air Prod.	Oil Temp. Reg. 6"
73	UA-6007-CF-DV5	United Air Prod.	Oil Temp. Reg. 7"
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OFF THE RECORD

Memoes From Aviation Week's Staff

Dear Bob & Mick: Los Angeles

Here's some incidental intelligence from my four-day cruise on the aircraft carrier Valley Forge.

The F9F seems to be a rugged fighter, with good landing characteristics. It's now well adapted to carrier routine. Chief pilot gripe is the "stick shaker". Seems it doesn't work properly and is liable to indicate a stall at almost any speed. So sometimes pilots land a little hot. The jets can be catapulted every 20 seconds or so. While warming up, jets are stacked around the flight deck with their tails pointing over the side.

Navy officers admitted the jet was treated like a prima donna at first. Then they discovered they could handle it as well as a Corsair or AD. Also learned how to hang more weight on it. A jet has a long way to go before it can take off with the Skyraider's load of some 6,000 lb. of bombs tho.

Most critical factor in carrier landings is judging speed of on-coming jets. Landing signal officer cant tell by the pitch as he can with a prop job. Jet looks the same at 90mph as it does at 130. So the margin between too fast and too slow a landing is darned tiny—about 10 knots. It's better to land a little fast than too slow and stall and go into the drink. But the jets can't land too fast either or they'll bounce over hooks and barriers into planes on the deck up forward. This landing speed is so critical a skipper of a carrier will fire off two extra boilers just to get an extra knot of wind acrossthe deck during jet landings.

Because of the critical landing factor the Navy and Raytheon are working like beavers to perfect a new FM radar landing speed indicator that works on a new principle and will give the air officer and the landing signal officer an accurate landing speed of the jets (also closing rate) and tells whether to wave the jet off or set it down.

Pilots think the F3H Banshee and North American's Fury both will be "comfortably in the 700 mile class." Not so much enthusiasm for the Douglas F3D Sky Knight. They say it hasn't yet been able to prove the weight-carrying claims made for it in some quarters. But theres lots of excitement on the A2D turboprop Skyshark.

Incidentally, some technicians say all carrier landings can be handled by CCA in about five years.

Incidentally, I found Navy more gentlemanly about discussing naval air and its place in the sun with the Air Force than is true the other way around. Most carrier people look for a period of fruitful activity for Naval aviation and carriers for 10 years. They don't care to look much beyond that. They believe Korea has proved necessity of naval and Marine aviation close support. They observed that these flyers had worked at close support harder than the Air Force has, so were successful in Korea.

Tom Self

WHAT'S NEW

New Books

The Aircraft Industry: A Study in Industrial Location, by Dr. William Glenn Cunningham, University of California, Los Angeles, with a foreword by Rep. Carl Hinshaw. Published by Lorrin L. Morrison, 1915 South Western Ave., Los Angeles 18; 248 pages, 14 maps, 17 statistical tables, price $6.00

This comprehensive study covers the manufacturing phases of the industry from its birth up to 1951, with special emphasis on the shifting locational patterns it developed in each period of its history.

Particularly detailed are the years 1940, 1944—the peak year of production, and the postwar period. The numerous charts and tables, compiled from official sources, make the volume valuable as a reference.

CAA Manual 100, the Flight Instruction Manual, prepared by CAA's Airman division. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., 184 pages, price $1.50.

Prepared principally for instructors and students, the manual contains a good deal of information that is also of interest to pilots. The information was formerly contained in five manuals. Obsolete material has been eliminated and new techniques and developments have been included. There is an appendix and a glossary of aeronautical terms.

Telling the Market

Catalog containing over 78,000 possible combinations of **bellows type expansion joints** and describing complete line of Sola-Flex aircraft bellows and assemblies may be had from Solar Aircraft Co., San Diego, Calif. . . . Facilities for producing transformers and electronic and electrical equipment for defense manufacturers are described by Acme Electric Corp. of Cuba, N. Y. Ask for **catalog MT-188.**

Aerocontactalogue is an attractive brochure printed in three languages available from Aerocontacts of Great Britain giving an idea of current price trends of new and second-hand aircraft available in that country. The company handles plane distribution and spares. Illustrated with photos of planes most in demand, it also gives specifications. There is a listing of available radio and navigation equipment. Write Aerocontacts, Ltd., Gatwick Airport, Horley, Surrey, England.

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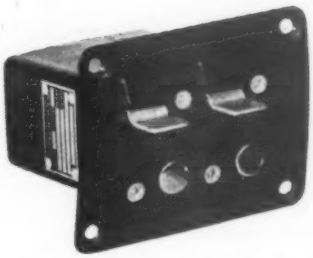
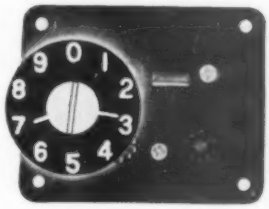
NOW SAFE FLIGHT BRACKETS THE PRE-STALL ZONE



Now Safe Flight, pioneer in stall instrumentation, offers progressive pre-stall detection to provide not only infallible pre-stall warning but also to bracket precisely the best landing approach speed for any gross weight condition.

The new multiple sensing unit on the wing's leading edge triggers the Safe Flight coaxially–mounted stick shaker which operates with variable amplitude to provide artificial pre-stall warning plus approach control with more precise definition and more exact margin than possible by any aerodynamic buffeting.



Simply DIAL Your Pre-Stall Margin!

Safe Flight stall sensing units now incorporate this adjustment dial to permit simple exact adjustment to any desired pre-stall warning margin for ideal approach speed control.

Safe Flight stall instrumentation systems are now standard on many armed services, airline and commercial aircraft. Your inquiry will bring prompt cooperation from our engineering staff in discussing your pre-stall instrumentation problems.

SAFE FLIGHT INSTRUMENT CORPORATION
White Plains, New York
PIONEERS IN STALL INSTRUMENTATION

EDITORIAL

Why Air Power Costs So Much

Our representatives in Congress are showing increasing interest in getting our money's worth from defense appropriations. North American Aviation's Kindelberger and Atwood did a convincing job recently in detailing to a congressional subcommittee how aircraft production costs have risen since World War II. AVIATION WEEK summarized this testimony Aug. 27.

Robert E. Gross, Lockheed Aircraft's President, last week in an address before the American Bankers' Assn. made an impressive contribution on the same subject:

"Aside from the present-day elements such as labor and materials, no small part of the high cost of air power is traceable to the sins of the past," he said. "Our cost of aviation today is not high just because of the high cost of the things we are doing today, but, instead, because of the things we didn't do in 1945, 1946, and 1947.

"That's the trouble with our air program today—and it's the only absolutely basic thing that is the matter with it."

This military aircraft business, Mr. Gross told the Bankers, is the longest manufacturing river in the world —the Mississippi of manufacturing, "and you can't get the big water out of the mouth if you shut it off at the source. And once you shut it off at the source, you can't suddenly turn it on and get the water out of the mouth of the river. It's got to flow just so fast and just so far and pick up its feeders along the line, and in the end you've got the big water flowing out at the mouth of the river."

So we shut off our airplane river and from August to September, 1945, we dropped from 2,800 planes a month to less than 800, and by the summer of 1946 we were down to 66 planes a month.

Several dry years went by. Then suddenly someone discovered Russia had an air force. Where did they get it, everyone asked. This is how they got it—they just didn't ever stop building the one they had, as we did.

So, Mr. Gross recalls, in 1948, we began to turn the water back into the stream. "But that shutoff in 1945 is now costing us the time and the big money . . . there's still a general and widespread lack of appreciation for the time-lag in aircraft production."

In 20 years between World War I and World War II, Mr. Gross points out, we spent an average of less than 28 million dollars a year for air, only to find that to dig us out of World War II we had to spend 28 million dollars a day, and for more than four years.

"We spent an average of about 1½ billion a year in the years 1946, 1947, 1948. Now we're having to spend 15¼ billions in just one year. And if conditions get worse, and if Sen. Lodge's proposal for a 150-group Air Force were to be adopted, it would call for 32 billion in fiscal 1952, 27 billion in fiscal 1953, and 37 billion in fiscal 1954. That's what the feast or famine costs us."

When will the American people learn that steadiness in moderation—rather than enormity in a crisis—is better and cheaper, Mr. Gross asks.

"Air power is expensive enough in itself, but when we add to it this insane cost of stopping and starting, we do two things: First, we run the cost up into the stratosphere; second, when we stop building we lay ourselves open to world attack—and the money we think we save in so-called fair weather, we have to quadruple to dig us out of foul. Steadiness rather than size in the pinches is the thing.

"These 30-billion-dollar-a-year crises would never come up if we kept up our guard all the time, and it need cost only a fraction of the way we've been doing it for the last 30 years."

Amen, Mr. Gross. Amen.

Put Up or Shut Up

We optimists who think aviation can carry more passengers economically that it has had a chance to prove are applauding Pan American Airways' blunt warning that it will start regular low-cost coach service over the North Atlantic next April, whether other members of IATA do or not.

It may be strong and undiplomatic medicine, but the traffic committee of the International Air Transport Assn. needed a purge to force action on North Atlantic tourist fares that it has been discussing languidly for years without any decision.

As long ago as 1948, Pan American notified its IATA fellow members that it was ready to start North Atlantic coach service.

The various meetings that have been held by IATA traffic committees ever since have agreed with Pan American that the idea is good in principle. Nothing much more ever happened until the Bermuda meeting several months ago when the usual agreement in principle was augmented by a daring assertion that such service might start in the fall of 1952 with a fare to be set somewhere between $225 and $250. But the other day in London the traffic brethren apparently were reflecting the dismal future so apparent everywhere in England and took no further action except to jack the proposed fare bracket up to $275 to $300 and to talk it all over again at the next meeting in November in sunny France.

Of course, Civil Aeronautics Board and the State Department could put the blocks to Pan American's effort to try out this new service. But CAB already has indicated that it favors trans-Atlantic air coach, and it has said that the fall of 1952 is too late a starting date. Pan American feels confident that its announcement will finally force some action.

It says in effect, "Put up or shut up."

Shoptalk

AVIATION WEEK announces that Tom Self, who has been serving us and our sister McGraw-Hill magazine, Business Week, as Los Angeles correspondent, will represent Business Week full time effective Oct. 1. We hope to announce appointment of a new representative in the Southern California area in the near future.

—Robert H. Wood